THE IRON TRADE REVIEW

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HEAVY ORDERS.

FOR STEEL RAILS FROM STEAM RAILROAD AND TRACTION COMPANIES.

Conversion contract for bars and shapes.—Plate business heavy.

The most important transactions of a rather quiet week were in rails, the principal orders being: Erie, 15,000 tons; Big Four, 6,000 tons; Chicago & Alton, 5,000 tons; Illinois Central, 10,000 tons; Buffalo, Rochester & Pittsburg, 3,000 tons; Valley Road, 3,000 tons, and Cleveland traction companies, 6,000 tons. The Dominion Iron & Steel Co., at Sydney, Nova Scotia, has obtained an order for 25,000 tons of rails from the Intercolonial Railway Co. in competition with mills of the United States, Germany and Great Britain.

More Cars for Japan.

The Pressed Steel Car Co. has received an order from the Japanese government for 900 box cars, which, closely following the order for 1,000 cars awarded to the American Car & Foundry Co., gives some indication of the demand for American products which may be expected as soon as peace is a certainty. Although the number of orders for new vessels for the lakes already placed is unprecedented, it is probable that additional contracts will soon be made, thereby increasing the already strong demand for plates.

Merchant Pipe Demand.

The demand for merchant pipe shows still further improvement and the low prices of a few weeks ago do not now prevail. Sheet tonnage has increased somewhat, but independents are active and the principal producer is showing an inclination to meet the competition.

Large Tonnage on Books.

None of the furnaces or steel works supplying the mills producing the heavier forms of material have been shut down, nor will they be closed, even for the regular summer repairs, on account of the tremendous tonnage now being carried on the books of all the steel manufacturers. On certain sections of structural shapes Pittsburg mills cannot make deliveries in less than five months, while on ship plates the Pittsburg mill cannot make deliveries before November.

Pig Iron is Quiet.

The Northern pig iron market has followed the Southern in weakness. On No. 2 foundry $15, Valley, is the ordinary price, and it is probable that this could be shaded. The naming of lower prices, North and South, has not encouraged buying. Nearly all the basic and Bessemer production of the merchant furnaces is being piled and it is estimated that 80,000 tons of iron will be on hand in the Valleys by July 1. Some further curtailment of blast furnace capacity has taken place, the Steel Corporation now having twelve idle stacks, but the blowing out of three furnaces was due to an accident to the blooming mill at New Castle. In spite of the temporary dullness, confidence is still felt that the second half of the year will witness a heavy buying movement. The erection of a large blast furnace by a Cleveland firm is announced and it is expected that the stack will be in operation within a year.

Iron Scale Adjusted.

The prompt settlement of the bar iron scale made by the Republic Iron & Steel Co. will be accepted by all independent iron manufacturers employing union men. It is not expected that an agreement on the sheet and tin plate scale will be so quickly reached and it is probable that some of the sheet and tin mills will be closed July 1, but it is hoped that the same spirit of fairness which prevailed at the Detroit conference will be manifested in considering sheet and tin plate scales.

Conversion Contract.

The International Harvester Co. has made a conversion contract of considerable interest by which it will furnish steel billets and blooms to a Chicago company, which will convert them into bars and shapes, thus giving the Harvester Company a wide range of sizes and shapes. In order to comply with its contract, the company which will make the conversion will install a 12-in. mill at East Chicago.

NEW FURNACE

Will be Built by Corrigan, McKinney & Co. at West Pittsburg, Pa.

Corrigan, McKinney & Co., Cleveland, will build a new blast furnace at West Pittsburg, Pa., which town is on the P. & L. E. R. R. near New Castle Junction, about 50 miles northwest of Pittsburg. The stack will have a capacity of 350 tons per day and will make both foundry and steel making irons. This firm is now operating the Scottdale furnace, Scottdale, Pa., the Genesee furnace at Charlotte, N. Y., and the River furnace at Cleveland. It is one of the largest independent interests in the Lake Superior mines.

The Scottdale Furnace Co., operating the Scottdale Furnace at Scottdale, Pa., has been incorporated in Pennsylvania by James Corrigan and Price McKinney, of Cleveland, and Amos E. Gillespie, of Scottdale. This is not a new concern, but merely the incorporation of a limited partnership.

WILL PROBABLY FAIL.

Independent Steel Consolidation not Meeting with Favor.

PITTSBURG, June 14.—The indications are that the attempt to consolidate the independent sheet manufacturers, projected at a meeting held here on May 12 by M. B. Kelly and Eugene S. Reilley, will fall through. A number of the manufacturers refused to give options on their plants and those that did put in such ridiculous figures that no consolidation can possibly be figured on.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Pig Iron Market Quiet—Corporation Co's. Twelve Stacks Banked.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, June 13.

There has been little change in the iron and steel situation during the week. The pig iron market continues exceedingly quiet and transactions are limited almost entirely to carload lots at concessions from the prices quoted a week ago. In finished lines merchant pipe continues to improve, and while concessions are still being made, the low prices that ruled several weeks ago have been withdrawn. Sheet tonnage has improved slightly, but on tin plate the situation is practically unchanged. Concessions on wire products of about $1 a ton are reported, but despite these prices the mills are not booking much new business.

This week the Carnegie Steel Co. banked three furnaces at New Castle and the fourth stack at that place was blown out for relining. The Bessemer steel plant at that place was also shut down, the closing of the entire plant resulting from an accident to the blooming mill. The tin plate mills operated by the American Sheet & Tin Plate Co. which depend on this steel plant for their bars are being temporarily supplied from the Ohio works at Youngstown. On the first of the month the United States Steel Corporation had five blast furnaces idle, but in the past two weeks seven stacks have been either banked or blown out making a total of twelve, which is a greater idle capacity than the corporation has had at any time in the past six months.

Plate tonnage continues heavy, especially for open-hearth stock, but on Bessemer tank plate deliveries can be made in 30 days.

The lower prices named on pig iron this week have not attracted consumers, who are not even inquiring for second half requirements. Southern furnaces are now quoting $12, Birmingham, on No. 2 which is equivalent to $16.35, Pittsburg, but this big reduction is not attractive to consumers who believe that still lower prices will prevail before they will be compelled to cover for future consumption. As low as $15, furnace, has been done by Northern producers on No. 2, while furnaces in the Hanging Rock region are quoting $16.25, Pittsburg, for high grade No. 2 iron. Several small lots of Bessemer iron have sold at $15, Valley, and on a desirable order this price could be shaded 25 cents a ton.

The settlement of the bar iron scale last week insures peace in that branch of the iron industry, and the scale signed by the Republic Iron & Steel Co. will be accepted by all the independent iron manufacturers employing Amalgamated men. In view of the early adjustment of this scale it was believed that a conference would be immediately arranged with the American Sheet & Tin Plate Co. for the purpose of adjusting the sheet and tin plate scale, despite the fact that it has been practically agreed to hold the conference the last week in this month. Owing to the big increase in wages asked in these lines it is extremely doubtful whether an agreement can be reached in the five days remaining in the scale year and the shutting down of all the union sheet and tin mills of the largest producer at least is expected on July 1.

Pig Iron.—While practically the entire Bessemer and basic production of the merchant furnaces in the Valleys is being piled, none of the furnaces are preparing to blow out and by the first of next month at least 80,000 tons of iron will be stocked in the yards of these producers. The Republic Iron & Steel Co. has a supply of Bessemer estimated at from 40,000 to 60,000 tons on hand, while the Jones & Laughlin Steel Co. now has in its yards in this city close to 100,000 tons of Bessemer and basic. The Republic Iron & Steel Co. accumulated its large stock during last summer's depression while the Jones & Laughlin Steel Co. has been accumulating its iron during the past twelve months, and is no doubt being carried on account of the unfavorable decision in the ore dust suit brought by the residents on the hill overlooking the Eliza stacks. In view of this heavy tonnage carried in the yards, an early advance in steel making irons cannot be expected and a considerable period of activity will have to come upon the trade to work up this surplus stock. This week the Carnegie Steel Co blew out the McKinley furnace at New Castle and banked the other three furnaces on account of the shutting down of the steel mill at that place. Only one of the furnaces of the Bessemer Association in the Valleys is now idle, while the steel corporation has twelve stacks out. On June 1, out of a total of 188 furnaces contiguous to the Lake Superior ore region, only 17 were idle, the active capacity being 92 percent, the same as on May 1. The United States Steel Corporation was operating 95 percent of its capacity and the Bessemer Association 90 percent. The Republic Iron & Steel Co. had all four of its furnaces in operation. We revise quotations as follows:

Bessemer, Valley	$14 75 to 15 00
Bessemer, Pittsburg	15 60 to 15 85
No. 1 Foundry	16 25 to 16 50
No. 2 Foundry	15 85 to 16 10
Gray Forge, Pittsburg	15 00 to 15 10
Basic, Valley	14 75 to 15 00
Basic, Pittsburg	15 60 to 15 85

Steel.—The steel corporation now has three Bessemer steel plants idle, located at Columbus, Wheeling and New Castle. The latter will resume, however, as soon as repairs can be made to the blooming mill. Bessemer billets, second half delivery, are quoted $22; for prompt delivery, $23. Open-hearth billets, prompt delivery, $24.50; open-hearth sheet bars, $25 to $25.50. Bessemer and open-hearth rods, $33 to $34.

Ferro-Manganese.—The market continues quiet and foreign ferro, eighty percent, is quoted at $50 to $51, delivered in carload lots, f. o. b. mill, Pittsburg district.

Muck Bar.—We note the sale of 6,000 tons of neutral bars for equal monthly deliveries through the second half at $26.95, Pittsburg. We also note the sale of 300 tons of bars for immediate delivery at $27.45, Pittsburg.

Skelp.—Iron skelp is a little easier, but steel is firm and in fair demand. We quote: Grooved steel 1.50c and sheared 1.55c to 1.60c; grooved iron 1.65c and sheared 1.70c.

Rails and Track Material.—The rail mill at the Ohio works of the Carnegie Steel Co., Youngstown, O., will not operate on rails this year as the demand on its capacity for billets and sheet bars will insure full operation practically through the end of the year. Light rails are in better demand but prices continue low. We quote: Fifty lb. and over 500 tons, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 16 lb., $25 to $25.50; 20 lb., $24 to $24.50; 25 to 45 lb., $22 to $22.50; angle bars for standard sections, 1.25c; spikes, 1.70c.

Plates.—One local mill cannot make deliveries on ship plates before November, while on car sizes of open-hearth plates none of the mills can make deliveries in less than three months. Bessemer tank however continues quiet and deliveries can be promised in 30 days. We quote as follows: Tank plates, 1¼ in. thick 6¼ in. to 14 in., inclusive, 1.50c f. o. b. mill Pittsburg; over 14 in. up to 100

in., 1.60c. Extras are as follows per lb.: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 in. up to 110 in. width, not less than 5c per lb. extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except the Pacific Coast.

Bars.—There is practically no new business in steel bars, but specifications are heavy and all of the mills are operating in full. On iron bars some of the mills are doing as low as 1.55c, which is $1 lower than has been quoted. We revise quotations as follows: Bar iron, 1.55c to 1.60c, Pittsburg; hoops 1.65c, and bands, 1.50c, both taking hoops and band extras respectively. Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator, $1.50c, net; channels, angles, zees and tees, under 3 in., 1.65c. The following differentials are maintained on steel: Less than 200 lb. of a size and not less than 1,000 lb., 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Structural Material.—The American Bridge Co. now has orders on its books for more than 400,000 tons of material, while independent structural concerns have their capacity sold up for the next three to four months. On certain sizes of shapes local mills cannot make deliveries in less than five months, while on the larger shapes better than 60 days to three months cannot be done. We quote as follows: Beams and channels up to 15 in., 1.60c; over 15 in., 1.70c; angles, 3 x 2 up to 6 x 6, 1.60c; zees, 1.50c; tees, 1.65; angles, from 3 to 16 in., 1.60c; universal and sheared plates, 6¼ to 14 in., inclusive, 1.50c; over 14 in., 1.60c base.

Sheets.—New business in sheets improved slightly during the week and the American Sheet & Tin Plate Co. placed its Piqua, O., plant in operation and started up four idle mills at its Aetna-Standard plant. Few of the independent manufacturers are running full, but the fact that more new business is now coming to the mills indicates that the surplus stocks of the jobbers have been pretty well worked off. We quote as follows: No. 30, 2.70c; No. 29, 2.60c; No. 28, 2.30c; No. 27, 2.20c; Nos. 25-26, 2.20c; Nos. 23-24, 2.15c; Nos. 18-20, 2.10c; No. 16, 2.10c; Nos. 12-14, 2.05c; No. 9, 2c; Nos. 8, 1.95c; Galvanized, No. 30, 4.30c; No. 29, 3.80c; No. 28, 3.40c; No. 27, 3.20c; Nos. 25-26, 3c; Nos. 23-24, 2.80c; Nos. 18-20, 2.65c; No. 16, 2.50c.

Wire and Wire Nails.—Concessions of $1 a ton are now being made on all classes of wire products, these concessions not being based on the present published prices but from the prices made earlier in the year which are $1 lower. The movement of material from jobbers' stocks is fair, but little new business is being taken by the mills. We quote: Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85c, and less than carloads, $1.95; painted barb wire, $1.95 for jobbers in carloads; retailers' carloads, $2, and less than carloads, $2.10, with 30c for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron and steel cut nails, $1.70 to $1.75.

Merchant Steel.—Demand for merchant steel continues fair and most of the material that is being rolled is shipped on contract specifications. Consumers are not closing for second half requirements and they are not expected in the market before the middle of July. We quote as follows: Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.70c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.70c to 1.75c; toe calk, 2c to 2.05c.

Pipe and Tubes.—Demand for merchant pipe continues to improve and the largest producer now has specifications on his books for six weeks' output. There is little doing in line pipe. While concessions on merchant pipe continue to be made, the extremely low quotations have been withdrawn. Discounts to consumers, carload lots, f. o. b. Pittsburg, plus freight to destination according to Tube Rate Book, are as follows:

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	67	51	65	49
⅜ to 6 inches	75	65	73½	63½
⅜ and ½ inch	71	59	69	57
7 to 12 inches	70	58	68½	58
Extra Strong Plain Ends.				
⅛ to ¾ inch	60	48	58	46
⅜ to 4 inches	67	55	65	53
4½ to 8 inches	63	51	61	49
Double extra strong plain ends, ⅜ to 8 inches	56	45	54	43

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1¼ inches	44	41
1 ¼ to 2½ inches	56	41
2½ inches	58	46
2¾ to 5 inches	64	53
6 to 12 inches	56	41

Less than carloads 2 points less.

Old Material.—The scrap market continues very quiet and quotations continue to decline. The Pennsylvania and B. & O. railroads both disposed of large tonnages this week at extremely low prices, indicating that they expect lower prices in the next 30 days. Consumers are not buying on the present basis and all the material that is moving is being taken up by the interests that sold short several months ago. Demand for old car wheels is heavy on account of the activity of the car wheel foundries that are operating on heavy orders placed by the railroads. We revise quotations, gross tons, as follows: Heavy melting stock, $14 to $14.25; No. 1 wrought, $14.50 to $15; re-rolling rails, $14; bundled sheet scrap, $12 to $12.50; busheling scrap, $12 to $12.25; turnings, $9 to $9.25, and cast scrap, $13 to $13.25.

Coke.—Connellsville coke producers are asking from $2.10 to $2.20 for furnace coke for delivery the last half of the year and are not inclined to accept business on a lower basis, believing that much higher prices will prevail before the end of the year. Furnace operators on the other hand are willing to close on the basis of $1.80 and as a result no business is being placed for last half delivery. Foundry coke is selling at $2.35 to $2.40. While the production of the Connellsville region has fallen off slightly, it amounts only to about 3,000 tons weekly.

Out of a total of 23,553 ovens in the upper region 20,982 are in operation, while in the lower region only 436 are idle out of a total of 6,883. During the week ending June 3, the production of the upper region amounted to 265,208 tons, while the lower region produced 82,935 tons.

CHICAGO.

International Harvester Co. makes Conversion Contract.—Market Quiet.

OFFICE OF *The Iron Trade Review*,
1104 MONADNOCK BLOCK, June 13.

Pig iron continues the center of interest in the local market. Furnaces have been unable to arrest the downward movement of prices and Southern No. 2 is now openly quoted at $12.00 Birmingham, a drop of 25 cents a ton from the open quotation of a week ago. Local irons are sharing in the weakness existing, and while $16.50 Chicago for No. 2 is possibly the lowest quotation that

has been made by Chicago furnaces, there is strong rumor to the effect that a lower figure has been quoted in a number of instances. In finished steel, the situation is without material change. Specifications for the heavier forms are heavy, all the mills being loaded with shipping orders to the limit of their capacity. It develops that the Carnegie Steel Co. is sold up on heavy rails, having found it necessary a short while ago to transfer a round tonnage to the Lorain Steel Co. for shipment. The demand for the lighter forms of material is not so insistent. On some products, notably black and galvanized sheets, prices are irregular. In steel bars a disturbing element has been created by the efforts of a number of jobbers and large consumers who overbought their requirements a year ago at the low prices then ruling to dispose of their surplus tonnage at prices below those asked by mills. Trading in bar iron is light, though manufacturers have stiffened on their quotations, the leading local seller holding firm at 1.55c. To consumers of these two products, the conversion contract recently arranged between the International Harvester Co. and the Interstate Iron & Steel Co., both of Chicago, is of interest. This contract covers several thousand tons of steel billets and blooms, to be furnished to the Interstate Iron & Steel Co. by the International Harvester Co., and by them manufactured into steel bars and shapes. The latter company will market and use in its own factories, the finished material thus produced, thus giving them a wide range of sizes and shapes. In order to fulfill these requirements the Interstate Iron & Steel Co. will install an additional 12 in. mill at the East Chicago, Indiana works. This mill is expected to be in operation about July 1, and will give the company a monthly capacity of about 7,500 tons of bars and shapes. Scrap appears to have gained renewed strength, the indications being that the bottom has been touched. The order for 15,000 tons of coke which the International Harvester Co. has been receiving figures on for the last ten days has not yet been placed. It is understood the company expects to buy at less than 2.25c at the ovens.

Pig Iron.—With the exception of a purchase of about 2,000 tons of basic iron by a local wire manufacturer about ten days ago for June shipment, there has been no buying to speak of in this market for the last two weeks. Melters have been doing considerable shopping with their inquiries, which range from 2,500 tons downwards, but more with the idea of sounding sellers on prices than with the intention of covering for their wants. The lowest price developed in this market on Southern iron is $12.00 Birmingham for No. 2 Foundry, and on Northern irons, $16.50. Some reports are current that as low as $16 has been name on local irons, but these cannot be traced to any authoritative source and are unequivocally denied by all the Chicago furnaces. A number of local foundrymen are holding out for lower prices than Southern furnaces are now willing to name, and $11.50 and $11.75 iron are frequently talked of. It is doubtful, however, in view of the number of stacks banking their fires or going out of blast, and the greatly increased melt of iron in this section, whether furnaces will permit prices to go to these levels. Few foundrymen are covered beyond the first half of the year, and an active buying movement is bound to be felt as soon as it is realized the market has touched bottom. We have revised our prices, and quote, Chicago delivery, as follows:

Lake Superior charcoal	$17 25 to 17 50
Northern Foundry No. 1	17 00 to 17 50
Northern Foundry No. 2	16 50 to 17 00
Northern Foundry No. 3	16 00 to 16 50
Northern Scotch Foundry	17 00 to 17 50
Ohio Strong Softeners No. 1	19 30 to 19 80
Ohio Strong Softeners No. 2	18 30 to 18 80
Southern Foundry No. 1	16 15 to 16 40
Southern Foundry No. 2	15 65 to 15 90
Southern Foundry No. 3	15 15 to 15 40
Southern Foundry No. 4	14 90 to 15 15
Southern No. 1 Soft	16 15 to 16 40
Southern No. 2 Soft	15 65 to 15 90
Southern Gray Forge	14 90 to 15 15
Southern Mottled	14 90 to 15 15
Southern Silveries (4% to 6% Silicon)	17 40 to 18 00
Jackson Co. Silveries (6% to 8% Silicon)	20 30 to 21 30
Jackson Co. Silveries (8% to 10% Silicon)	21 30 to 22 30
Alabama and Georgia Car Wheel	20 65
Malleable Bessemer	16 50 to 17 00
Basic Iron	16 15 to 16 65

Billets.—In average lots, there is a brisk demand for forging billets. All the large producers are out of the market, current orders being supplied by independent makers. Premiums continue to be exacted by local sellers. We quote open hearth billets, $31 to $32 Chicago; Bessemer re-rolling, $28; sheet bars, $29.50; Bessemer wire rods, $34 Pittsburg; chain rods, $35 Pittsburg.

Bars.—New business in either iron or steel bars is of light proportions. Prices of bar iron have stiffened materially since our last report, the leading local sellers now holding firm at 1.55c Chicago. In steel bars, some confusion has been created by the efforts of several jobbers and large consumers to sell their surplus tonnage at lower prices than have prevailed before the expiration of their contracts. Most of these were placed at low figures and a good profit can be made by selling considerably below the present market. An item of interest is the announcement that the Interstate Iron and Steel Co., of this city, has made a conversion arrangement with the International Harvester Co., covering several thousand tons of blooms and billets which are to be furnished by it to the former company and rolled by them into bars and shapes. The finished material thus produced will be used and marketed by the Harvester company. Prices are without change, and we quote carload lots, mill shipments, Chicago delivery, as follows: Bessemer and open-hearth bars and bands, 1.66½c base, half extras; soft steel angles, less than 3 x 3, 1.76½c; hoops, 1.81½c base, full extras. Store trade is active and prices are firm. We quote bar iron, 1.90c base, full extras; soft steel bars and bands, 1.85c to 1.95c base, full extras; soft steel angles, channels and tees, under 3 in., 1.95c to 2.05c; hoops, 2.20c base, full extras.

Sheets.—Irregularity continues in box annealed sheets and in galvanized. The cutting is being done largely by independent manufacturers and jobbers who are unusually hungry for business. Small orders for black sheets can be placed on the basis of 2.30c Pittsburg for No. 28 gauge, while desirable specifications bring out better prices. This is true also to a large extent in galvanized, and 3.56½c Chicago for No. 28 can be shaded on a good sized order. We have revised our prices, and quote carload lots, mill shipments, Chicago delivery, as follows: Blue annealed sheets, Nos. 9 and 10, 1.81½c; Nos. 11 and 12, 1.86½c; Nos. 13 and 14, 1.91½c; Nos. 15 and 16, 2.01½c. On box annealed, one pass, cold rolled, we quote, Nos. 18 and 20, 2.21½c; Nos. 22 and 24, 2.26½c; Nos. 25 and 26, 2.31½c; No. 27, 2.36½c; No. 28, 2.46c½c; No. 29, 2.56½c; No. 30, 2.66½c. We quote on lots from warehouse stocks as follows: No. 10, 2.10c to 2.15c; No. 12, 2.15c to 2.20c; No. 14, 2:20c to 2.25c; No. 16, 2.30c to 2.35c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.70c to 2.75c; No. 27, 2.75c to 2.85c; No. 28, 2.85c to 2.95c; No. 29, 3c to 3.05c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: Nos. 12 and 14, 2.51½c; No. 16, 2.66½c; Nos. 18 and 20, 2.81½c; Nos. 22 and 24, 2.96½c; No. 26, 3.16½c; No. 27, 3.36½c; No. 28, 3.56½c; No. 29, 3.81½c. Jobbers' prices on lots from store are as follows: Nos. 10 to 14 inclusive, 3.10c; No. 16, 3c; Nos. 18 and 20, 3.10c; Nos. 22 and 24, 3.25c; No. 26, 3.50c; No. 27, 3.70c; No. 28, 3.95c; No. 29, 4.40c; No. 30, 4.85c.

Structural Steel.—Specifications continue to be of ample proportions, taxing the capacity of the mills to the utmost. Railroad orders are the heaviest, the latest from this source the specifications for part of the steel required in the construction of 2,000 box cars for the C. B. & Q. Rail-

way. The contract for the extension to the Milwaukee plant of the Allis Chalmers Co. mentioned last week has been divided between the American Bridge Co. and Riter-Conley Co. About 10,500 tons of steel will be required. In addition, contracts have been let for the construction in Chicago of the Brevoort Hotel, calling for 1,500 tons of steel shapes, and for the Rothschild Building at State and Jackson streets, which will require about 800 tons. We quote mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in., inclusive, 1.76½c; angles, 3 to 6 in., ¼ in. and heavier, 1.76½c; angles larger than 6 in., or one or both legs, 1.86½c; beams larger than 15 in., 1.86½c; zees, 3 in. and over, 1.76½c; tees, 3 in. and over, 1.86½c; with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. We quote prices from store as follows: 2.10c to 2.25c for angles, beams and channels, base sizes, with 2.20c to 2.30c for 18, 20 and 24-in. beams; tees and zees, 2.15c to 2.25c. These prices are for either random lengths or cut to specifications in excess of 5 ft.

Plates.—There is little news to report regarding this product. Mills are laboring under heavy specifications and demand shows no signs of diminishing. We quote carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼ in. and heavier, 6⅛ in. to 100 in., 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base, all full extras. Plates, 3-16 in. thick, $2 extras; gauges 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Store quotations are as follows: Tank steel, ¼ in. and heavier, up to and including 72 in. wide, 2c; over 72 in. wide up to 100 in., 2.10c; over 100 in. wide, usual mill extras, 3-16 in. up to but not including 72 in. wide, 2.10c; 3-16 in., 72 in. wide, 2.35c; flange steel, 25c extra; heads, 25c extra.

Merchant Pipe.—Mills report a brisk demand for all sizes of pipe. Usually some falling off is apparent at this time of the year, but none has been noticed to date. On the contrary, the specifications of last week were the heaviest for some time past. The following prices are for carload lots, random lengths, f. o. b. Chicago:

MERCHANT PIPE.

	Steel.		Iron.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ¼ inches	65.85	49.85	63.85	47.85
⅜ to ½ inches	69.85	57.85	67.85	55.85
¾ to 6 inches	73.85	63.85	72.35	62.35
7 to 12 inches	68.85	53.85	67.35	51.85
PLUGGED AND REAMED.				
	Steel.		Iron.	
1 to 4 inches	71.35	61.35	69.85	59.85
EXTRA STRONG PIPE.				
⅛ to ⅜ inches	58.85	46.85	56.85	44.85
½ to 4 inches	65.85	53.85	63.85	51.85
4½ to 8 inches	61.85	49.85	59.85	47.85
DOUBLE EXTRA STRONG PIPE.				
½ to 8 inches	54.85	43.85	52.85	41.85

Boiler Tubes.—The consumption of this product in this section as evidenced by new orders and specifications continually coming in, is very heavy. All the local jobbers report a brisk business. Prices are firm and without change. We quote carload lots, mill shipments, Chicago delivery, as follows:

BOILER TUBES.

	Steel.	Iron.	Seamless.
1 to 1½ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
			Up to 4½ inches 50.50
6 to 13 inches	52.35	37.35	

Less than carload lots from store, as follows:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	30
2¾ to 5 inches, inclusive	60	47½	42½
6 inches and larger	50	35	

Rails and Track Supplies.—New inquiries for heavy rails continue to be received almost daily, but unless buyers are willing to take any delivery that can be given the leading producer is declining them. Recently the Carnegie Steel Co. which has been taking the bulk of the business offered the local company since it withdrew from the market, was forced to turn over a round tonnage to the Lorain Steel Co. because it could not give the delivery required by the buyer. It is understood that the Carnegie Steel Co. is practically sold up for the balance of the year on heavy rails. There is a good demand for light sections and track supplies, though western producers are not guaranteeing deliveries. We quote heavy sections in 500-ton lots and over, f. o. b. mill, $28; less than 500 tons to carload lots, $30; less than carload lots, $32. Light rails are as follows: 12-lb. sections, $27; 16-lb., $26; 20 and 25-lb., $25; 30, 35, 40 and 45-lb. sections, $24, all f. o. b. Milwaukee mill. Track supplies, f. o. b. Joliet mill, Angle bars, 1.40c to 1.50c; spikes, first quality, 1.75c to 1.80c; track bolts, 3¼ x ¾, with square nuts, 2.40c to 2.50c per lb., with hexagon nuts, 2.55c to 2.65c.

Merchant Steel.—Further new business is reported by local sellers, though none of the large contracts spoken of last week has been let: Mills are overloaded with orders, and it is doubtful if some of the leading producers will be in position to take on much if any new tonnage for some months to come. Prices are without change and we quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c; smooth finish machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21½c. Cold rolled shafting, 50 percent off in carload lots and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and upwards.

Cast Iron Pipe.—Neither the contract from Belden, Mich., for 1,250 tons of pipe, nor that from Crestline, Ohio for 1,850 tons has been let, though it is expected both will be closed up this week. Routine business is of good proportions. Prices are weak in sympathy with the pig iron market, and a reduction is looked for daily. For the present, we continue our quotations on carload lots, Chicago delivery, as follows: 4-in., $29; 6-in. and larger, $28; gas pipe, $1 a ton higher.

Wire Products.—In some quarters a falling off in business is noted, but as this is the usual experience around the hot period no uneasiness is felt. The specifications from the manufacturing trades are very heavy, indicating abnormal activity in these fields. Prices are without change, and we quote to jobbers on carload lots, Chicago delivery, as follows: Wire nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.05; galvanized staples, $2.35. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½ and 5 percent and 85 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet and DeKalb, with actual freight allowed not exceeding 30 cents per 100 lb.

Foundry Coke.—No appreciable change is noted in the local situation. The scarcity of demurrage coke has given the market greater strength, and quotations on contracts covering any length of time are very firm. Interest is centered on the pending purchase of the International Harvester Co. of 15,000 tons of coke. All the bids are not yet in, but it is understood that better than $2.25 at the ovens will have to be made by Connellsville sellers to land the order. On ordinary sized contracts, local sellers are quoting Standard 72 hour Connellsville coke at $2.50 at the ovens. Virginia and West Virginia brands range from $2.35 to

$2.50 at the ovens. Wise County, Va. coke is offered on the same basis (Chicago delivery) as Connellsville cokes.

Old Material.—Current trading is limited to such small lots as are from time to time offered either to dealers or consumers at a price necessary to move the iron. There is no consumptive demand worth the name in evidence at the present time. The market, however, is stronger, and the downward progress of prices seems to have been arrested. We find it necessary, however, to revise several of our quotations to get properly in line with the changed conditions. On gross tons, local dealers are asking as follows:

Old steel rails (4 feet and over)	$13 00 to 13 50
Old steel rails (less than 4 feet)	12 50 to 13 00
Old iron rails	17 50 to 18 00
Relaying rails, subject to inspection	22 00 to 22 50
Old wheels	14 00 to 14 50
Heavy melting steel	12 00 to 12 50
Mixed country steel	10 00 to 10 50

The following quotations are for net tons:

No. 1 R. R. wrought	13 50 to 14 00
No. 2 R. R. wrought	12 50 to 13 00
Shafting	15 00 to 15 50
Dealers' forge, No. 1	10 50 to 11 00
Wrought pipe and flues	9 50 to 10 00
No. 1 cast, 150 lb. and less	12 50 to 13 00
No. 1 mill	8 50 to 9 00
No. 1 Busheling	9 50 to 10 00
No. 2 Busheling	8 00 to 8 50
Country sheet	7 00 to 7 50
No. 1 boilers, cut	9 00 to 9 50
Boiler punchings	12 50 to 13 00
Iron car axles	19 50 to 20 00
Steel car axles	14 50 to 15 00
Iron axle turnings	9 50 to 10 00
Cast borings	7 00 to 7 50
Mixed borings, etc.	7 00 to 7 50
Machine shop turnings	9 50 to 10 00
Railroad malleable	12 50 to 13 00
Agricultural malleable	11 50 to 12 00
Stove plate and light cast scrap	9 00 to 9 50
Old iron splice bars	15 50 to 16 00

CLEVELAND.

Railroads Rendering Admirable Service—Pig Iron Dull.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, June 14.

Iron Ore.—Long before the opening of navigation this year, it was known that the movement of ore for 1905 would probably break all records and it was expected that many difficulties would be encountered in carrying from 30,000,000 to 32,000,000 tons from upper to lower lake ports. While some doubt was expressed as to the ability of the boats to do their part, the chief concern was as to whether the railroads would be able to take care of the ore going direct from docks to furnaces. Up to the present date everything has moved with surprising smoothness and it is agreed on all sides that the railroads are rendering admirable service. The result is that vessels are getting quick dispatch and the record breaking rate of last month is being kept up; indeed, it will not be surprising if 5,000,000 tons of ore are shipped this month.

Pig Iron.—The pig iron market is weaker, North and Southern. On Northern irons, $15 Valley for No. 2 foundry is now the usual quotation, while local furnaces are selling to home consumers at $15.75. Rumors are current of lower quotations on Ohio iron shipped outside of the state. Inquiries for basic are more numerous, but little business is being done in any kind of pig. In the South, the ordinary quotation is $12 for No. 2 Birmingham and it is probable that 25 cents better could be done by a large buyer. We quote f. o. b. Cleveland as follows:

Bessemer	$15 60 to 15 85
No. 1 Foundry	16 25 to 16 50
No. 2 Foundry	15 75 to 16 00
No. 3 Foundry	15 25 to 15 50
No. 2 Southern	15 85 to 16 00
Gray Forge	15 00 to 15 25
Gray Forge, Southern	14 25 to 14 50
Lake Superior charcoal	17 00 to 17 25

Finished Material.—There is still more sparring between buyers and sellers of steel bars, but at present the latter are not disposed to concede a lower price than 1.50c Pittsburg and the time for the agricultural interests to place their orders may be indefinitely delayed. The bar iron market is somewhat irregular, with prices ranging from 1.50c to 1.55c, according to the desirability of the order. Local mills will soon be closed for repairs. Although the number of new buildings planned or being erected in this city is large, the present demand for structural material is not heavy. Jobbers, however, have done a large business from stock in shapes as well as in other kinds of finished material. The demand for sheets is only fair.

Inquiries amounting to about 10,000 tons of standard section rails have been on the market from traction companies this week and orders for about 6,000 tons have been placed. Additional orders for plates for new ships are pending.

Old Material.—Scrap took another drop practically all along the line during the past week and dealers are looking for still lower prices. Better conditions are not looked for before about August 1. The railroads are offering large lots of scrap to dealers. We quote gross tons, Cleveland delivery, as follows:

Old iron rails	$19 00 to 20 00
Old steel rails (over 6 feet)	13 50 to 14 50
Old steel rails (under 6 feet)	13 50 to 14 50
Old car wheels	14 00 to 14 50
Steel boiler plate	9 50 to 10 50
Steel axles	15 50 to 16 50
Malleable iron (railroad)	13 50 to 14 50
Malleable iron (agricultural)	12 25 to 13 25
Heavy steel	13 00 to 14 00

We quote as follows, net tons:

No. 1 R. R. wrought	13 50 to 14 50
No. 1 busheling	11 50 to 12 50
No. 1 machine cast	12 00 to 12 50
Iron axles	20 00 to 21 00
Axle turnings	10 00 to 11 00
Wrought turnings (free from cast)	8 50 to 9 50
Grate bars	8 00 to 9 00
Pipes and flues	9 50 to 10 50
Tank iron	8 50 to 9 50
Hoop and band iron	7 00 to 8 00
Sheet iron	6 00 to 7 00
Wrought drillings	8 50 to 9 50
Stove plate	8 50 to 9 00
Cast borings	6 00 to 7 00

CINCINNATI.

Increase in Inquiries for Pig but Sales are not Numerous.

June 13.

Pig Iron.—The only perceptible change in the pig iron market during the week has been an increase in the inquiries and more interest on the part of buyers as to the probable course of the market and efforts to locate prices. Actual buying, however, has not increased and but few orders have been booked and these for comparatively small tonnages. The largest inquiry in this territory has been from an Ohio concern who wants 2,000 or 3,000 tons of basic iron for delivery in July and August. We hear of larger inquiries for both foundry and basic in Chicago territory. An Indiana concern asks for prices on from three to five hundred tons of foundry iron for third quarter delivery with the privilege of taking some in June. A sale of 150 tons of Northern iron and 150 tons of Southern iron at a point in Ohio is said to have brought out quotations of $11.75 for No. 2 foundry, Birmingham and slightly less than $15.00 for No. 2 at Ohio furnace. It is now fairly well established that under competition $11.75 Birmingham can be done on southern iron and it is reported that $15 Ohio furnace is rather freely quoted. Southern grey forge is in abundant supply and offered at $10.50 Birmingham which price can probably be shaded on a firm offer, but there seems to be no inquiry for this grade. Bessemer iron is quoted at $14.75 furnace and it is intimated that $14.50 would be accepted. It is to be observed from the above that the market is weak with sellers seeking business at the sacrifice of prices. The figures named above may be regarded, however, as minimum prices. The current quotations on southern iron remain at $12 Birmingham in a general way and some business has been done

during the week on small lots at this figure. A feature of the situation now presents itself as to the probable contest for business in Ohio territory between Northern and Southern irons. It is intimated in some quarters that Southern producers will be active competitors with the Northern furnaces for business in this territory during the second half of the year and this view of the situation is not encouraging for stability of prices. Quotations are revised to conform to this week's late information. We quote f. o. b. Cincinnati as follows:

Southern Foundry No. 1	$15 00 to 15 25
Southern Foundry No. 2	14 50 to 14 75
Southern Foundry No. 3	14 00 to 14 25
Southern Foundry No. 4	14 00 to 14 25
Southern Foundry No. 1 soft	15 00 to 15 25
Southern Foundry No. 2, soft	14 50 to 14 75
Gray Forge	13 25 to 13 50
Northern Foundry No. 1	16 65 to 16 90
Northern Foundry No. 2	16 15 to 16 40
Northern Foundry No. 3	15 65 to 15 90
Southern Charcoal	19 25 to 19 50

Finished Material.—The jobbing demand continues active for structural shapes and it is difficult to obtain early shipments from the mills. There is fairly good buying of steel bars both for present and forward delivery. Sheets and plates rule quiet but steady. Bar iron is dull and easy. Bar iron is quoted at 1.55c; steel bars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets at 75 and 7½ percent off. We quote black sheets, No. 27, at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.20c; No. 14, 2.10c; No. 12, 2.05c; No. 10, 2c. Tank plates are firm and sell out of store at 2c for ¼ in. and 2.10c for 3-16, No. 8 and No. 10. Beams and channels are quoted at 2c from stock and angles at 2c to 2.05c for base sizes.

In merchant pipe the situation is unchanged, but the market is quiet with some shading of prices on the part of independent mills on certain sizes. The leading interest is firmly maintaining its schedule. We quote f. o. b. Cincinnati:

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	65.35	49.35	63.35	47.35
⅜ and ½ inches	69.35	57.35	67.35	55.35
¾ to 6 inches	73.35	63.35	75.85	61.85
7 to 12 inches	68.35	53.35	66.85	51.35

Old Material.—While the market is not quotably changed, there is no business reported and sellers are anxious to induce trading so that quotations could readily be shaded if a buyer came into the market. We quote:

Old No. 1 railroad wrought, net tons	$14 00 to 15 00
Cast machine and foundry, net tons	11 00 to 12 00
Old iron rails, gross tons	19 00 to 19 50
Old steel rails, gross tons	15 00 to 15 50
Old short lengths, gross tons	13 50 to 14 00
Old iron axles, net tons	20 00 to 21 00
Stove plate, net tons	8 50 to 9 00
Wrought turnings, net tons	10 00 to 10 50
Cast borings, net tons	7 00 to 7 50
Car wheels, net tons	15 00 to 15 50

Coke.—There has been some increase in business, but the market continues weak with foundary coke quoted at $2.25 to $2.50 and furnace coke $1.75 to $2 f. o. b. ovens.

NEW YORK.

Transactions are Few and Developments are Awaited.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., June 13.

Pig Iron.—Conditions have not improved during the past week. Consumers are apparently greatly interested in the market for there are a great many inquiries, but in many cases they do not advance beyond the inquiring stage. Local dealers, however, report a fair movement of metal to regular customers. Producers are apparently confident that they will be able to hold the market at or near the present figure and are not pressing sales. The offer of Southern Foundry, No. 2 at $12, reported last week has not been generally met; $12.50 is the price usually quoted, and some have not seen fit to offer for less than $13. Regular customers accept small orders at the old prices. The repeated postponement of the placing of the large tonnage of foundry and basic iron by the American Locomotive Co., and the Gould Coupler Co., has caused some disappointment, but hopes have been revived by the report that the former firm intends to place its order during the next week. The strike among the foundries of New York and New Jersey has not as yet aroused serious apprehensions. Unless it becomes more general, extending to surrounding territory, its effect upon the market will, it is believed, be inconsiderable. New York quotations to tide water follow:

Northern No. 1 Foundry	$16 75 to 17 25
No. 2 Foundry	16 25 to 16 75
No. 2 Plain	15 75 to 16 00
No. 1 Southern Foundry	17 00 to 17 25
No. 2 Foundry	16 25 to 16 75
No. 3 Foundry	16 00 to 16 25
No. 4 Foundry	15 50 to 15 75

Foundry pig iron warrants follow:

	Bid.	Asked.
June	$15 00	$15 75
July	15 00	15 75
October	.....	.....
February	.....	.....

Finished Iron and Steel.—Business in finished steel continues to be excellent. New demand for structural steel is appearing and business in rails continues. Railroads which have recently placed orders for rails are the following: C. C. C. & St. L., 6,000 tons; Erie, 15,000; Chicago & Alton, 5,000; Illinois Central, 10,000; Buffalo, Roch. & Pitt., 3,000, and the Valley Road 3,000. Business in plates and bars continues satisfactory with a good promise for the future. We quote New York prices at tide water: Angles, 3 to 6 in. x ¼ in. and heavier, 1.74½c; beams, 3 to 15 in., 1.74½c; channels, 3 to 15 in., 1.74½c; beams, 18, 20 and 24 in., 1.84½c; tees, 3 x ¼ in. and heavier, 1.79½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine and ordinary firebox, 1.94½c; refined iron bars, 1.64½c; soft steel bars, 1.64½c to 1.67c; sheets in carload lots, New York, No. 28, black, 2.40c.

Old Material.—Although indications point to a more active demand, conditions have shown no material improvement. Small lots are the regular and prices very irregular. Holders are showing considerable confidence in the future and a turn favorable to sellers is expected. Quotations approximately, f. o. b. New York as follows:

Old iron rails	$21 00 to 22 00
Old steel rails, long lengths	14 50 to 15 00
Old steel rails, short pieces	14 00 to 14 50
Relaying rails	20 00 to 21 00
Old car wheels	15 00 to 15 50
Old iron car axles	22 00 to 23 00
Old steel car axles	19 00 to 20 00
Heavy melting steel scrap	14 50 to 15 00
No. 1 railroad wrought scrap	18 00 to 18 50
Iron track scrap	15 55 to 16 50
Wrought pipe	12 50 to 13 00
Cast borings	10 00 to 10 50
Wrought turnings	14 00 to 14 50

PHILADELPHIA.

Little New Business—Pig Iron Prices are Somewhat Lower.

June 13.

Market conditions continue unsatisfactory, so far as new business is concerned, and the immediate future seems to hold no definite prospect of improvement. Taking pig iron as the basis of trade, there is some diversity of opinion as to the situation. Some houses, while admitting that they are receiving but few orders, and those for small amounts for prompt delivery, report an increase in inquiries regarding the third quarter and upon this base their belief that July will witness a marked turn in the tide. Others declare that there has been a distinct weakening in the market, and their view is apparently con-

firmed by a further decline in prices. The situation is full of complications, in which crop prospects, the outlook for peace in Manchuria, the continued excessive production of the furnaces and general business conditions all play their part in confusing the view of the future.

Pig Iron.—No material change is to be noted during the past week except that prices continue to soften. The demand is very light, and some furnaces begin to report accumulations which, unless speedily disposed of, can result only in further price concessions or a radical cut in production through the blowing out of some of the weaker furnaces. Prospective buyers are watching developments closely, unwilling to place large orders while the indications point to probable reduction in prices, but ready to step in as soon as they think bed rock has been reached. Certainly that psychological moment has not yet arrived. Prices meanwhile are a little droopy, and may be quoted as follows:

No. 1X Foundry	$17 75 to 18 00
No. 2X Foundry	16 75 to 17 00
No. 2 Plain	16 00 to 16 25
Standard Gray Forge	15 25 to 15 50
Ordinary Gray Forge	14 75 to 15 00
Basic	16 00 to 16 25
Low phosphorus	20 50 to 21 00

Finished Material.—No let-up is reported from the mills working upon the heavier lines. Indeed, word received by local correspondents of the Carnegie Mills in Pittsburg state that last week's output was the largest in their history. Premiums continue to be asked for plates and structural material, but in the lighter lines there is considerable room for improvement. Bar iron, reflecting the weakness in scrap, shows a slight concession in price, but otherwise prices remain at schedule figures, as follows: Beams, channels and angles, according to specifications, 1.73½c to 1.85c; refined iron bars, 1.63½c to 1.80c; steel bars, 1.63½c to 1.70c; plates, 1.73½c to 1.80c.

Old Material—The tendency is still downward in the scrap market, the mills refraining from much buying. It is believed, however, that the market is being gradually cleared of the old material which speculative dealers shipped in carload lots to various points of consumption in expectation of sales, and which they had to dispose of on the mills' terms to save demurrage charges. More inquiries are noted, but sales are not active. Prices may be quoted as follows:

Old steel rails	$14 75 to 15 50
No. 1 steel scrap	14 75 to 15 25
Old steel axles	19 00 to 20 00
Old iron axles	21 00 to 22 00
Old iron rails	19 00 to 20 00
Old car wheels	15 00 to 15 50
Choice scrap, R. R. No. 1 wrought	16 50 to 17 00
No. 1 yard scrap	15 50 to 16 00
Machinery scrap	14 50 to 15 00
Low phosphorus scrap	20 00 to 21 00
Wrought iron pipe	12 00 to 12 50
No. 1 forge fire scrap	13 00 to 14 00
No. 2 forge fire scrap, ordinary	10 00 to 11 00
Wrought turnings	11 50 to 12 00
Axle turnings, heavy	13 00 to 13 50
Cast borings	8 50 to 9 00
Stove plates	9 50 to 10 00

BIRMINGHAM.

Southern Market Dull—Heavy Production at Steel Plants.

BIRMINGHAM, Ala., June 13.—The Southern pig iron market is quite dull, but the furnacemen appear to be anticipating an early improvement in conditions. No. 2 foundry is quoted at $12 per ton, with reports heard that a lower figure is being received. The furnacemen when asked as to the market do not give out conditions as to quotations willingly.

The Sloss-Sheffield Steel & Iron Co. has one furnace out for repairs, but it is announced that this will not last long, the work of repairing being pushed. The furnaces in blast are doing nicely, everything considered. The shipments from this district are not equal to the production. The furnacemen state that consumers are still asking immediate delivery on all old orders of iron, indicating that their supplies are running low. There is a little inquiry still being received in this district, but not as extensive as it might be and that which is being received is not developing into trade.

The production at the steel plants holds up well and there is a strong demand for the products. Southern railroads are laying Ensley rails as quickly as they can have the product delivered to them.

The Woodward Iron Co. will shortly be making iron with its new furnace at Woodward.

The Tennessee Coal, Iron & Railroad Co. has almost completed the repairing on the two remaining furnaces at Bessemer and expects to put them in operation shortly.

There is no hesitation whatsoever in the manufacture of cast iron pipe in this district. The statement is made that some large orders were recently secured for pipe and the plants in this district will be kept busy for some time to come. Good prices obtain for pipe.

The record for No. 6 furnace, the latest furnace at Ensley belonging to the Tennessee Coal, Iron & Railroad Co., is 380 tons. The management believes this record can be outdone and an effort will be made in that direction. No other furnace in the South has even approached this record in production.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., June 13.

Pig Tin.—The market since last report has been firmer owing to increased activity in London. Today's closing follow: Spot, 30.20c to 30.40c; June, 30.20c to 30.40c; July, 30c to 30.37½c; August, 29.85c to 30c; London, £138 2s 6d to £136 15s. Arrivals 1,135 tons to date with 1,793 tons afloat.

Copper.—Foreign consumers have left the market to domestic melters and prices remain unchanged. Today's closings follow. May, 15c; Lake and electrolytic, 15c; casting, 14¾c. London's closings today: Spot, and futures, £66 2s 6d. Exports for the month to date, 6,334 tons.

Lead.—There was a fair demand for all grades of pig lead and prices were well maintained. Today's closings follow: 4.50c to 4.60c. St. Louis, 4.44½c; London, £13.

Spelter.—The market for spelter has been very quiet. Today's quotations: Spot, 5.35c; June, 5.25c to 5.35c; St. Louis, 5.07½c to 5.15; London, £24.

Antimony.—Prices are still higher than last week, raising from 11c to 11½c for all brands.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, June 13.

Demand for metals is of low order. All prices are weak and subject to change from day to day. By the time this issue is off the press, concessions from the following prices can be obtained. We quote as follows: Lake copper, 15c for carload lots, and 15¼c for less than carload lots. Casting copper, 14¾c for carload lots, and 15c for less than carload lots. Spelter, 5.50c for carload lots, and 6c for lesser quantities. Sheet zinc is without change at 7¼c for carload lots of 600-lb. casks, and 7½ for less than carload lots. Pig tin, 30c for carload lots, and 30½c for less than carload lots. Pig lead, 4.45c for 50-ton lots, 4.50c for carload lots and 4.55c for less than carload lots. Antimony, both Cookson's and Hallett's, is quoted at 9½c.

Dealers' quotations on old metals are approximately as follows: Copper wire, 13c; heavy copper, 12c; light copper, 11c; red brass, 11c; red brass borings, 9c; yellow brass, 8c; yellow brass borings, 7c. Pipe lead, 4c. Tea lead, 3.60c. Zinc, 4.15c.

The Hazleton Iron Works has granted an increase of 10 percent to its molders and core makers at Hazleton, Pa.

WELFARE WORK

DISCUSSED AT PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.

Who Meet With Ladies Present—Address by Miss Beeks.

The last regular meeting before the summer recess of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on Wednesday evening, June 7, President Thomas Devlin occupying the chair. There were about forty-five members and visitors in attendance, including several ladies. In his opening remarks the President stated that although this was the 148th meeting, it was the first at which the Association had been honored by the presence of ladies, and on this occasion he thought it very appropriate that the program of the evening be set aside for them. Miss Gertrude Beeks, secretary of the Welfare Department of the National Civic Federation, New York City, who had been announced as the speaker for the evening, was then introduced.

Prefatorial to the subject, which included ventilation, drinking fountains, lunch rooms, shower baths, individual wash rooms, locker rooms, and gymnasium for the foundry and machine shop, Miss Beeks explained that the object of the association which she represented was to bring about more rightful relations between employer and employe. In the course of her remarks, which were profusely illustrated with lantern slides, she stated that the parties mostly concerned in industrial disturbances were represented in the membership of the National Civic Federation by prominent employers, labor leaders, and the public.

The Welfare Department of this organization, of which Miss Beeks is the secretary, was organized at the Waldorf, New York, a little over a year ago, the purpose of this department being to promote the welfare work for employes. The 150 members are naturally employers who

LOCKER ROOM AND SHOWER BATHS OF THE ENTERPRISE MFG. CO.

employ large and few numbers of men and women. Among other photographs of those prominently connected with the federation, one of Mr. H. H. Vreeland, the chairman of this department, was thrown on the screen. Mr. Vreeland was expected to participate in the discussion of the subject, but on account of sudden illness was unable to attend the meeting.

Miss Beeks stated that the Welfare Department aims to educate employers and convince them of the necessity of showing especial consideration for the welfare of employes, and for that purpose conferences have been had with men who have tried these things and succeeded. In the National Civic Federation Review, a monthly publication, special topics are presented, and picture pamphlets for different trades are in preparation and will be issued shortly. It will be demonstrated, for instance, that portable houses may be supplied for workers in the building trades where clothes and other articles may be kept and luncheon and hot coffee served. Such places are very desirable when you take into consideration the kind of weather in which some men are compelled to work constantly.

Through the Bureau of Exchange of the Welfare Department a vast amount of data may be had and photographs supplied to employers.

WASHROOM AND SHOWER BATHS OF THE CLEVELAND CLIFFS IRON CO.

The great value of light and depressing effect of dark work rooms was emphasized, poor light being the cause of many headaches. Ventilation by means of sliding doors in the roofs, and the exhaust air system were also alluded to, and the various methods in vogue at different establishments explained. Slides were shown of apparatus employed for removing dust from the foundry, sand room, and the advantage of automatic stokers in use at different places was demonstrated. By means of a series of pipes fresh air is supplied to the faces of the workers. Pure drinking water easily accessible is another essential feature. One method of supply was shown where water is delivered at 55 degrees F. and kept in constant circulation.

A slide was exhibited showing an establishment fitted with individual wash bowls of enameled iron, so constructed that they might be tipped over into troughs, where the water would run off. Shower baths were also installed, and departments well fitted with wire lockers, it being claimed that wooden lockers are not the best on account of the accumulation of vermin, and by the use of wire lockers this danger is not only eliminated but a good source of ventilation is admitted. Methods of drying clothes on steam pipes were also shown on the screen, and the necessity for general janitor service in large establishments mentioned. In many cases the question as to why these facilities were not made uses of by the men was answered by the fact that they are inadequate, unclean, too cold and frequently the men do not know of the existence of such accommodations, which were sometimes in remote places. In several instances the floors are of concrete with wooden racks in the individual compartments upon which the men stand, and the entire floor can be easily cleaned by a hose stream. Slides were shown of dressing rooms for women, where the clothing in stormy weather is hung over steam pipes and dried in a method similar to that used for the men.

While it is not essential that a girl should be seated all day at her work, yet is necessary that she should sit part of the time, and chairs fitted with back and foot rests according to the height should be provided for her welfare. These can be so constructed on rollers, fitted in grooves, that they may be readily moved from place to place enabling the girl to operate several machines. Photographs were shown of lunch rooms for the officials, the superintendents, and the working classes, and the different styles of lunch counters in use, where some bits of food have a nominal price of three, four and five cents. The attractive and clean lunch room is more apt to be a success than one which is not so pleasant. In some establishments the junior help have coffee, tea and milk given them.

Rest rooms and hospitals for both sexes were also shown, and the methods of fire protection and the advisability of organizing fire brigades among the younger men suggested, and a description given of some houses for firemen showing the delightful surroundings.

The question of transportation was referred to, showing conveyances for both men and women, and the better method of allowing the girls to leave the factory a few minutes before the men, instead of all at the same time, thus meeting the moral question and preventing the jostling of the girls by the men. Special stress was laid upon the importance of forming men's clubs, where the men may assemble and play pool, and of providing places where meetings may be held once a month; also emergency hospitals where relief may be had in cases of serious accident. Another very good feature adopted by different concerns is the policy of establishing vacation houses, where employes may spend their holidays.

In some establishments two weeks' vacation is given with pay to all engaged over one year, and in other cases overtime has been abolished with good results. Several views of employes' homes and tenement houses were exhibited, the rent for which is made nominal, and all for the welfare of the employes.

Each industrial establishment is a study. Certain things may be done in one place which may not be applicable to another in the same trade, but in any event constant attention is needed or failure is the result.

A vote of thanks was tendered to Miss Beeks for her most able address, which was backed up by the statement from Secretary Evans that he was going to start in with some of the arrangements mentioned at the plant of the J. W. Paxson Company, as he had been so very much delighted with the subject.

Dr. Brown said that this was the third address on welfare work that he had had the pleasure of listening to, and that it was by far the best that he had heard, and he could not do less than follow Mr. Evans' lead.

Abram Cox Co's. Plans.

The representative from the Abram Cox Stove Co. stated that that company had organized a club for the heads of the departments, where different subjects were discussed and complaints made every month. He believed that it would lead up to something valuable, but was not prepared to say what has been done at this time. Four meetings have been held and some good has been accomplished, but not in the direction of the welfare of the men. The work has been taken up and he believes it will lead in that direction.

In reply to a question, Miss Beeks said that about twelve wash bowls for sixty employes are sufficient in cases where they have only to wash their hands.

Mr. Thompson said that of all the meetings he had attended, this was one of the most interesting he had heard yet, and he hoped there would be many more like it.

A letter was read from the Pennsylvania Child Labor Committee in reference to the employment of children and calling attention to the fact that certificates issued by notaries are no longer legal but must emanate from the school authorities.

The treasurer's report showed a balance of $2,038.37 and all bills paid.

After an announcement that the next meeting would be held on the first Wednesday in September, the meeting adjourned.

Those in Attendence.

Miss Gertrude Beeks, Sec'y National Civic Federation, New York.
Mr. and Mrs. Thos. Devlin, Thos. Devlin Mfg. Co., Philadelphia.
G. Warren, J. W. Paxson Co., Philadelphia.
Geo. C. Davis, Chemist, Philadelphia.
Davies, Pilling & Crane, Philadelphia.
H. E. Baer, Stanley G. Flagg & Co., Philadelphia.
Harry O'Neil, Philadelphia Hdw. & Mall. Iron Co., Philadelphia.
Henry Drinkhouse, Thos. Devlin Mfg. Co., Philadelphia.
C. Gorman, Harry Huder, Walter McDonald and C. D. Muir, Schaum & Uhlinger, Philadelphia.
M. A. Schoales, Thos. Devlin Mfg. Co., Philadelphia.
Michael Bergman, Md. Silica Co., Baltimore.
J. W. Pearce, Merritt & Co., Philadelphia.
Harry Brown and Dr. Elmer E. Brown, E. E. Brown & Co., Philadelphia.
H. G. Mitchell, Rogers, Brown & Co., Philadelphia.
W. Myers, *The Iron Trade Review*, Philadelphia.
H. Fuller, Abram Cox Stove Co., Philadelphia.
[illegible], Sill Stove Works, Rochester.
Chas. Orr and Henry Yost, Thomas, Roberts, Stevenson Co., Philadelphia.
Luther Shick, Isaac A. Sheppard & Co., Philadelphia.
H. L. Haldeman, Pulaski Iron Wks., Philadelphia.
H. Thompson, J. Thompson & Co., Philadelphia.
W. Muller, *Iron Age*, Philadelphia.
P. C. Pullman, J. Wesley Pullman, Philadelphia.
H. C. Matlack and Thos. Pole, J. K. Dimmick & Co., Philadelphia.
[illegible] Simonson, Wm. Wharton Jr. & Co., Philadelphia.
Howard Evans, J. W. Paxson Co., Philadelphia.

THE KIMBERLY ESTATE.

About $2,000,000 for Charity—Bequests to Execurors and Others.

The will of the late Peter Kimberly appoints Geo. A. Baird, vice president and general manager of sales of the Republic Iron & Steel Co., Chicago; John Owsley, Sharon, Pa., and Ira B. Bassett, president of the Bassett-Presley Co., Cleveland, executors, and provides that the estate shall be kept intact for five years. It is estimated that at the end of that period the property will amount to $10,000,000. The payment of several annuities is provided for and it is then directed that the remainder of the estate shall be disposed of as follows: 23 percent to be devoted to charity, the specific object of such charity to be determined by the executors; Amos Kimberly, brother of the deceased, 17½ percent; Mrs. Murdock, a sister, 4 percent; each of the executors, 5 percent; and several relatives, 3 percent each; James W. Brainard, Pittsburg, 1 percent.

ENTIRE PLANT

Of Carnegie Steel Co. at New Castle, Pa., is Closed Temporarily.

Owing to an accident to the blooming mill, the entire plant of the Carnegie Steel Co., at New Castle, Pa., has been shut down temporarily. This includes the Bessemer department, which had to go off on account of the shutting down of the blooming rolls. As the direct metal process is in use at this plant, it was also found necessary to bank the three blast furnaces until the steel plant is in operation again. The furnaces banked are the Rosena, Shenango and Red Jacket. The McKinley stack has been blown out for relining. Sheet bars for the two tin mills at New Castle are now being shipped from the Ohio works at Youngstown. The Shenango tin mill at New Castle, containing 30 mills, is scheduled to shut down shortly for repairs.

The fourth Talbot furnace of the Jones & Laughlin Steel Co., Pittsburg, was placed in operation this week. The fifth furnace, which will complete the steel plant, will be placed in operation in about 60 days.

Amalgamated Association Bar Iron Wage Scale.

DETROIT CONFERENCE GRANTS ADVANCES.

New Scales Satisfactory to Republic Iron & Steel Co.

The bar iron wage scale of the Amalgamated Association of Iron, Steel & Tin Workers for the year 1905-06 beginning July 1, was adjusted at Detroit on Friday, June 9, after a four day conference with officials of the Republic Iron & Steel Co. The scale has been signed by this company and no difficulty will be experienced in having the independent iron manufacturers west of the Allegheny mountains agree to its terms, since it is satisfactory to the largest producer. While the demands for increases in the different lines as agreed upon in convention were not granted the association, the new scale carries with it substantial advances and concessions. The increase for the puddlers average about 2½ percent, while the finishers who demanded an increase of 13 percent received an advance of a little more than one-third of their demands. The roughers are also to receive an increase of 6 percent. The changes in the existing scale and the new terms granted are as follows:

Boiling.—Based on actual sales of bar iron, as per bi-monthly conference agreement:

	Boiling per ton 2240 lbs. 1904-05	Boiling per ton 2240 lbs. new scale 1905-06
1 c Bar Iron	$ 4 90	$ 5 00
1 1-10c "	4 90	5 00
1 2-10c "	4 90	5 00
1 3-10c "	4 90	5 25
1 4-10c "	5 12½	5 50
1 5-10c "	5 37½	5 75
1 6-10c "	5 62½	6 00
1 7-10c "	5 87½	6 25
1 8-10c "	6 12½	6 50
1 9-10c "	6 37½	6 75
2 c "	6 62½	7 00

Footnotes 1 to 29 inclusive remain unchanged.

Footnote No. 30 was changed to read as follows: "When the company insists that swarth alone shall be fomented, the price shall be the price paid for boiling."

Footnote No. 31 as demanded by the convention was eliminated but a new footnote No. 32 was added and is as follows: "That when the company insists upon working scrap balls weighing over 400 rounds extra help shall be furnished and paid by the firm."

New footnote No. 33 as agreed upon in convention was granted and is as follows: "That all swarth used as a mixture, with metal or cobbles, shall be paid for at the price governing the metal."

Footnote No. 34 agreed upon in convention was not granted and was therefore eliminated.

Muck and Puddling Mill Scale.—No change was made in the Muck or Puddle Mill scale except that the men on these mills share in the advance on boiling which amounts to 2½ percent.

Footnote No. 8 as demanded by the association was not granted and was eliminated, and the demands of footnote No. 9 were left over for local settlement.

Piles on Boards.—Based on actual sales of bar iron, as per bi-monthly conference agreements.

	Piles on Boards per ton 2240 lbs. 1904-05	Piles on Boards per ton 2240 lbs. 1905-06
1 c Bar Iron	$ 1 50	$ 1 57
1 1-10c "	1 54	1 61
1 2-10c "	1 58	1 65
1 3-10c "	1 62	1 68
1 4-10c "	1 65	1 71
1 5-10c "	1 68	1 74
1 6-10c "	1 71	1 77
1 7-10c "	1 74	1 80
1 8-10c "	1 77	1 83
1 9-10c "	1 80	1 86
2 c "	1 83	1 89

Footnote No. 1 in this scale was changed to read 88 5-10 cents instead of 91 6-10 cents a ton for piles or blooms on sand bottom. Footnote No. 4 was added as follows: "That helping to charge means placing the piles on peel. In busheling on sand bottom a change in the base was asked from $2 to $2.20 on a 1-cent card rate. An advance of 5 cents a ton was granted and the scale advances five cents a ton with every increase of one-tenth cent in the selling price of bar iron.

Scales Busheling on Sand Bottom.—Based on actual sales of bar iron, as per bi-monthly conference agreements.

	Per Ton, 2240 pounds 1904-5	Per Ton. 2240 pounds, new scale, 1905-6
1 c Bar Iron	$ 2 00	$ 2 05
1 1-10c "	2 00	2 10
1 2-10c "	2 05	2 15
1 3-10c "	2 10	2 20
1 4-10c "	2 15	2 25
1 5-10c "	2 20	2 30
1 6-10c "	2 25	2 35
1 7-10c "	2 30	2 40
1 8-10c "	2 35	2 45
1 9-10c "	2 40	2 50
2 c "	2 45	2 55

The changes asked in footnotes 7 and 8 were not granted, and the old notes remain unchanged, but note No. 14 agreed upon in convention was granted and is as follows: "Where flat scales are adopted to overcome local difficulties in busheling mills, no such scale can be signed by any lodge belonging to this association that will conflict with the complete application of all clauses in the busheling scale from clause six to thirteen.

The advances asked for knobbling were granted, and the wages for working scrap have been advanced on the base 23 cents a ton and for working refined iron 30 cents. New footnote No. 3 which was added follows: "That all sheet mill scrap be cut or bundled, not to exceed 22 inches in length.

The New and Old Knobbing Scales Follow: Based on actual sales of bar iron as per bi-monthly conference agreements.

	Scrap per ton 2,464 pounds, 1904-5	Scrap per ton 2,464 pounds, 1905-6	Refined iron per ton, 2,464 pounds, 1904-5	Refined iron per ton, 2,464 pounds, 1905-6
1 c Bar Iron	$ 4 37	$ 4 60	$ 5 69	$ 5 99
1 1-10c "	4 47	4 70	5 81	6 12
1 2-10c "	4 57	4 80	5 94	6 25
1 3-10c "	4 67	4 90	6 07	6 38
1 4-10c "	4 77	5 00	6 20	6 51
1 5-10c "	4 87	5 10	6 33	6 64
1 6-10c "	4 97	5 20	6 47	6 77
1 7-10c "	5 07	5 30	6 60	6 90
1 8-10c "	5 17	5 40	6 73	7 03
1 9-10c "	5 27	5 50	6 86	7 16
2 c "	5 37	5 60	6 99	7 29

For Heating Slabs and Shingling advances from 5 to 7 percent were made. Based on a 1 cent card shingling muck and rehammered iron 2,240 pounds was advanced from 67 9-10 cents to 71 cents; shingling charcoal iron, 2,464 pounds, 75 cents to 81 cents and heating, also shingling slabs and doubling, 2,240 pounds, 71 cents. New footnote No. 2 was granted as follows: "That shingler's helper receive not less than one-third and five percent, and when two helpers are employed, they shall receive not less than one-fourth each. Wages to be paid by the shingler."

Bar and 12-Inch Mill Scale.—While an advance of 13

percent was asked on the bar and 12-inch mill scale, no advance was granted and the scale remains the same as 1904-05. In footnote No. 7 the demand that five percent less than the base prices for rolling and heating steel be paid instead of six was not allowed and this section of the clause remains unchanged. But this does not apply on straight two-high bar mills or when working axles. Footnote No. 12 was changed to read: "The company shall pay the fireman on coal heating furnaces, except when the production on steel is 50 percent or more in any pay period. Then the company shall pay one-half, except when the present practice requires full payment."

No change was made in the base for mills making a specialty of working pipe or skelp from iron or steel and in the guide, 10-inch, hoop and cotton tie mills, the scale remaining the same as the present scale. Footnote No. 18 of this scale was made to conform with the fireman's clause in the bar mill scale. The new footnotes added to this scale follow:

No. 20.—When crop ends run excessive lengths, an effort shall be made by the management to correct the abuse; but when said excessive crop ends are sold as finished material at any later period, full scale prices shall be paid. All faggots or scrap piles shall be piled on scales and an effort be made during the year to arrive at an equitable percentage.

No. 21.—That the stranding and scrapping price shall be one-half the price paid for roughing; the same to be deducted from rollers' wages and paid by the company. This not to apply where present practice exceeds the above enumerated prices.

Clause 5 of the addenda was changed to read: "On all finishing mills the last furnace shall not charge later than one hour after the first furnace. On Saturday the first furnace shall cease charging seven hours from the regular time the mill starts to roll."

New clause No. 8 follows: "The company take the cinder out of the pit from all heating and busheling furnaces." These clauses are consessions on the part of the manufacturers as the former clauses provided that the furnaces should cease charging 7½ hours after the regular mill starts to roll and under the present scale the men pay for removing the cinder from the pits of busheling and heating furnaces.

METAL TRADES ASSOCIATION NOTES.

A number of the union patternmakers have gone out on strike in several of the shops in Columbus, Ohio. The non-union men in some cases remained at work and the places of the strikers are being rapidly filled so that the shops are running without serious inconvenience.

On Wednesday, June 7, the Machinists' Union in conjunction with the Metal Trades Council No. 9, of Chicago, called a strike on the factory of the Hanna Engineering Works. A few trusted machinists remained at work making a substantial nucleus for filling up the shop. The Chicago branch of the National Metal Trades Association and the National Association have the strike in hand and it is stated that all the help required will be obtained in a short time.

The Superintendents and Foremen's Club of the Chicago Branch of the N. M. T. A. met on Saturday evening, June 10, at the Sherman House. An interesting address on "The First Aid to the Injured,' was delivered giving information of a valuable kind for practical application in accident emergencies.

The molders employed by the Franklin Rolling Mill Co., of Franklin, Pa., are on a strike.

The coppersmiths employed by the Atlantic Works, of Boston, Mass., are out on strike for union hours and wages.

Two meetings of the New York and New Jersey Foundrymen's Association have been held to consider the demands of the Brotherhood of Foundry Employes for an increase in wages, the closed shop and the admission of walking delegates to the shops. The Association confirmed its previous action by rejecting all the demands. The representatives of the Brotherhood have already offered to waive every demand except that of an increase to $2 per day wages paid to foundry helpers and laborers. The demands were to take effect June 1, when it was expected that all helpers and laborers would go out on strike to enforce them in the shops where they were not granted. The demands were not granted and up to the present time no strike has occurred.

TO ARBITRATE LABOR DISPUTES.

During the past year the state of Massachusetts has enacted the following legisation bearing on the arbitration of labor disputes: "Chapter 313, section 1. Section two of chapter one hundred and six of the Revised Laws is hereby amended so as to read as follows: Section 2. If it appears to the mayor of a city or to the selectmen of a town that a strike or lockout described in this section is seriously threatened or actually occurs, he or they shall at once notify the State board; and such notification may be given by the employer or by the employes concerned in the strike or lockout. If, when the State board has knowledge that a strike or lockout, which involves an employer and his present or former employes, is seriously threatened or has actually occurred, such employer at that time, is employing, or upon the occurrence of the strike or lockout, was employing, not less than twenty-five persons in the same general line of business in any city or town in the Commonwealth, the State board shall, as soon as may be, communicate with such employer and employes and endeavor by mediation to obtain an amicable settlement or endeavor to persuade them, if a strike or lockout has not actually occurred or is not then continuing, to submit the controversy to a local board of conciliation and arbitration, or to the State board. Said State board shall investigate the cause of such controversy and ascertain which party thereto is mainly responsible or blameworthy for the existence or continuance of the same.'

LABOR NOTES.

Seventeen machinists at the Southern Iron & Equipment Co., Atlanta, Ga., have been called out on strike by the local lodge of machinists, as a result of a demand for an increase in wages.

The structural iron workers on the skyscraper at the corner of Church street and Fourth avenue, Nashville, Tenn., have fixed a scale of $4.00 per day and nine hours while the steel work is in progress.

Conferences are being held at New York between officials of the Erie Railroad and representatives of the company's machinists over propositions by the latter looking to the abolition of piece work in the shops.

The American Can Co.'s strike, Davenport, Ia., has been declared off, and with the exception of three men, it is understood the strikers will be reinstated and the former wage scale maintained.

As the result of the shooting of Edward Joyce, at Washington, D. C., at a meeting of the Philadelphia branch of the National Iron Workers and Bridge Builders' Union, 60 members of the union were locked up over night pending an investigation of the affair.

The Pressed Steel Car Co., Pittsburg, received an order from the Japanese Government for 900 box cars. This is in addition to the 1,000 cars recently ordered from the American Car & Foundry Co.

DEATH OF AMOS SHEPARD.

The death of Amos Shepard, of Duluth, which occurred at Whitewater, Wis., June 6, was unexpected and a great shock to his wide circle of friends. Mr. Shepard was injured some six weeks ago by a fall to the floor of the Kitchi Gammi club rooms in Duluth, during a sudden and slight attack of heart failure to which he was subject for many years. His skull was fractured, and it was at first thought he could not recover, but his splendid vitality and his temperate habits of life were sufficient to pull him along and he apparently grew much better. He left the hospital where he had been under treatment and was sent to his brother's home at Whitewater to complete his convalescence. There, two weeks later, he died, having never really recovered from the first effects of the accident. Mr. Shepard was born in Wisconsin 44 years ago, and after leaving school taught for a short time. In 1877,

AMOS SHEPARD.

at the beginning of the Menominee development, he went there determined to learn mining and began as a teamster for the Quinnesec mine, under Capt. Elisha Morcom. In 1883, when Charlemagne Tower opened the mines of the Soudan district he went there with Capt. Morcon as chief clerk, and remained at Tower for some years, finally leaving there upon his election to the position of register of deeds for the county. In this position his residence was at Duluth. Upon his retirement from the registership he re-entered mining, taking charge of work at the Menominee mines of the American Steel & Wire Co., under Capt. Sellwood, who was always especially interested and delighted by Shepard's progress and adaptability. Later he was placed in charge of the Menominee mines of Corrigan, McKinney & Co., and when they wanted a man at their Mesabi mines, to move an almost impossible volume of tonnage, sold at low prices, they selected him and put him in charge. For the past three years his residence has been at Stevenson, where he has been in immediate charge of the tremendous Stevenson mine, but he has also been superintendent of the remaining Mesabi mines of the group and of their Gogebic properties. Mr. Shepard was an able, energetic, skillful man, kindly and cultured and of wide intelligence. He was a delightful entertainer and his singing and his dialect stories, especially that masterpiece on system in mine accounts, were among the features of last fall's trip to Minnesota of the American Institute of Mining Engineers. No man in the northwest could tell a story better than Amos Shepard. His home life was exceedingly pleasant and companionable, and he leaves a widow and several children. His older son is a cadet at the United States Naval Academy, now in his second year.

Obituary.

Gustav Stieglitz, secretary and treasurer of the American Metalware Co., died at his home in Chicago, Sunday, June 4. He was 56 years old, was born in Germany and came to the United States and settled in Chicago in 1866. He has been in the metalware business since 1893.

S. Frank Eagle, Chicago, one of the best known blast furnace managers in the country, died May 25 of heart failure after four months' illness. He was 60 years old, born in Philadelphia.

William H. Read, after an illness of three weeks, died at his residence in New York, June 4. When a young man he was associated with his father in the iron business, but of late years held a position with the supreme court of New York state.

PERSONAL.

At a meeting of the directors of the Crucible Steel Co. of America, June 13, Charles E. Clapp resigned from board, also his position of general sales agent and fourth vice-president. It is understood that he will retire.

J. W. Davidson, master mechanic of the rail mill of the Colorado Fuel & Iron Co.'s plant at Minnequa, Colo., has gone to the Carnegie Steel Co.'s works at Pittsburg. Richard Schubert, master mechanic of the blast furnaces, has also gone to Pittsburg.

Don H. Bacon, chairman of the executive board of the Tennessee Coal, Iron & Railroad Co., has announced the appointment of Edwin Ball as general manager of mines for the Tennessee company, the new appointee to do some of the work heretofore done by the president. Mr. Ball has been manager of the ore mines for the Tennessee company. The Tennessee company has been without a general manager for over two months, since Charles McCrery resigned to go with the Woodward Iron Co. as chairman of their board. Mr. Ball is well acquainted with the mining operations, both ore and coal, of the Tennessee company in this State.

On June 7 Frederick William Cohen, civil and mechanical engineer for the Pennsylvania Steel Co., was married at Harrisburg, Pa., to Miss Mary Lee Rose, daughter of William J. Rose, division freight agent of the Pennsylvania railroad at Harrisburg. Mr. Cohen has had charge of important bridge erection and other work for the steel company. He is a graduate of Stevens.

Dr. George Revay, who attended the meeting of the Iron and Steel Institute in London, has returned after an extensive business trip in Europe. Dr. Revay is propagating the Coppie patent coke oven in this country. His office is at 45 Cedar street, New York City, where he devotes himself besides the construction of by-product coke ovens to consulting work as a chemical engineer and in the metallurgical mining line.

W. H. Harvey, of Eveleth, Minn., has been appointed county mine inspector by the St. Louis county commissioners. The office carries a salary of $2,000 a year and requires personal inspections of every mine in the county at least once in 90 days. This will require a man's entire time, for there are about 90 mines in the county. There were a dozen candidates for the place, most of them from Eveleth.

Jas. C. Davis, Jamestown, N. Y., has been promoted from superintendent of the plants of the American Steel Foundries Co. in the West to the general superintendency of all the plants of that corporation, with headquarters in New York.

INGERSOLL-RAND CO.

TWO LARGE MANUFACTURING CONCERNS ARE UNITED

With a Capital of $10,000,000—W. L. Saunders the New President.

After having been business rivals for more than 30 years and after negotiations extending over some time, the two largest manufacturers of steam, pneumatic and electric drilling, quarrying and tunneling machinery of the country, The Ingersoll-Sergeant Drill Co. and the Rand Drill Co., have formed a union. The new corporation, which was formed last week under the laws of New Jersey, will have a capital stock of $10,000,000, equally divided between preferred and common shares.

After the incorporation the new company was organized by the election of W. L. Saunders, president of the Ingersoll-Sergeant Drill Co., to the presidency; Geo. W. Doubleday, treasurer of the Ingersoll-Sergeant Drill Co., was chosen 1st vice president, and J. R. Rand, president of the Rand Drill Co., John A. McCall, president of the New York Life Insurance Co., and vice president of the Ingersoll-Sergeant Drill Co.; J. P. Grace, of W. R. Grace & Co., and vice president of the Ingersoll-Sergeant Drill Co., and George R. Elder, vice president of the Ingersoll-Sergeant Drill Co., and general manager of the manufacturing department, additional vice presidents. F. A. Brainard, treasurer of the Rand Drill Co., was elected secretary, and W. R. Grace, secretary of the Ingersoll-Sergeant Drill Co., treasurer.

The new company, which has taken over the stock and all the property of the two old concerns, will be known as the Ingersoll-Rand Co., and the general offices of the corporation will be in New York in the Havemeyer Building, No. 26 Cortlandt St.

It is the intention to run all seven of the old plants, which are those at Phillipsburg, N. J.; Easton, Pa.; Sherbrook, Canada; Tarrytown, N. Y.; Painted Post, N. Y.; Ossining, N. Y., and the plant at 34th St., New York City. There will be no radical changes in business methods or number of men employed.

"The new arrangement," said President W. L. Saunders to a representative of *The Iron Trade Review*, "is a union, a union of interests for the benefit of all concerned, for the benefit of customers as well as of stockholders. The two companies own valuable patents and can command ability in the way of skilled men, which can be joined to great advantage. It is our intention to manufacture rock-drilling and other machinery embodying the best of the patents and the skill formerly divided between the two separate firms."

Special Train of 50 Cars.

The McClintic-Marshall Construction Co., Pittsburg, shipped from its Rankin, Pa., plant on Saturday, June 10, 50 cars of structural material which will be used in the erection of the car shops of the American Car & Foundry Co., Madison, Ill. The plant will be 150 x 900 ft. and will be under roof on July 10, just 90 days after the contract was awarded. The 50 cars made up one train and will be run through to their destination as a special via the Pittsburg & Lake Erie and the Erie and Lake Erie and Western railroads.

G. W. McClure Son & Co., engineers and contractors, Pittsburg, have been awarded the contract for the erection of the four hot blast stoves for the new blast furnace that the Carnegie Steel Co., Pittsburg, is erecting at Mingo Junction, O. The stoves will be the McClure type 21 x 100 ft. The Kittanning Iron & Steel Co. is also adding a fourth McClure hot blast stove at its furnace plant, Kittanning, Pa., 20 x 80 ft.

IRON AND STEEL.

Production of 1904 Compared with that of 1903.

The printing of the annual statistical report of the American Iron and Steel Association, making a volume of 136 pages, has been nearly completed and it will soon be sent to the members of the association and to the press. *The Iron Trade Review* has received an advance copy of the following summary statement for 1904 compared with 1903:

From the Annual Statistical Report of the American Iron and Steel Association.

SUMMARY OF STATISTICS FOR 1903 AND 1904.

Subjects—Calendar years.	1903	1904
Production of Iron Ore, gross tons	35,019,308	27,600,000
Imports of Iron Ore, gross tons	980,440	487,613
Production of Bituminous Coal, gross tons	252,454,775	249,102,765
Production of Pennsylvania Anthracite, gross tons	66,613,454	65,318,490
Production of all kinds of Coal, gross tons	319,068,229	314,421,255
Shipments of Pennsylvania Anthracite, gross tons	59,362,831	57,492,522
Imports of Coal for Consumption, gross tons	3,479,430	1,623,280
Domestic Exports of Coal, gross tons	8,312,088	8,573,518
Production of Coke, net tons	25,202,360	23,621,520
Production of Pig Iron, gross tons	18,009,252	16,497,033
Production of Spiegeleisen, Ferro-manganese, and Ferro-phosphorus, included in Pig Iron, gross tons	192,661	220,392
Production of Bessemer Steel, gross tons	8,592,829	7,859,140
Production of Open-Hearth Steel, gross tons	5,829,911	5,908,166
Production of Crucible Steel, gross tons	102,434	83,391
Production of Blister and Patented Steel, gross tons	9,804	9,190
Production of all kinds of Steel, gross tons	14,534,978	13,859,887
Production of Open-Hearth Steel Castings, gross tons	400,348	302,834
Production of all kinds of Steel Castings, gross tons	430,265	330,211
Production of Bessemer Steel Rails, gross tons	2,946,756	2,137,957
Production of Open-Hearth Steel Rails, gross tons	45,054	145,883
Production of Iron Rails, gross tons	667	871
Production of all kinds of Rails, gross tons	2,992,477	2,284,711
Production of Structural Shapes, gross tons	1,095,813	940,146
Production of Iron and Steel Wire Rods, gross tons	1,503,455	1,099,028
Production of Plate and Sheet Iron and Steel, except Nail Plate, gross tons	2,599,005	2,421,398
Production of Bar, Bolt, Hoop, Skelp, Rolled Axles, Rolled Armor Plate, etc., gross tons	4,952,185	4,597,497
Production of all Rolled Iron and Steel, including Nail Plate and excluding Rails, gross tons	10,215,220	9,728,670
Production of all Rolled Iron and Steel, including both Nail Plate and Rails, gross tons	13,207,697	12,013,381
Production of Iron and Steel Cut Nails and Cut Spikes, kegs of 100 pounds	1,435,893	1,283,302
Production of Iron and Steel Wire Nails, kegs of 100 pounds	9,631,061	11,926,661
Production of Tinplates and Terne Plates, gross tons	480,000	458,000
Production of Ore, Pig, and Scrap Blooms for sale, gross tons	9,940	5,743
Imports of Iron and Steel, foreign value	$41,255,864	$21,621,970
Exports of Iron and Steel, home value	$109,025,865	$128,553,613
Miles of New Railroad built (estimated for 1904)	4,715	4,252
Tonnage of Steel Vessels built in the calendar year	295,840	160,809
Immigrants in the year ended December 31	957,371	808,907

CHICAGO STRIKE

Has caused little delay in shipments of iron and steel.

In our general review of the market last week, it was stated that the teamsters' strike in Chicago had resulted in a congestion of iron and steel stocks in that city, compelling the delay of shipments. This statement was unjust so far as those jobbers, such as Jos. T. Ryerson & Son, and the Scully Iron & Steel Co., are concerned, as they have exceptionally fine railroad facilities, with sidings and connections to all lines. Although several large manufacturing concerns which ship to Chicago have reported to *The Iron Trade Review* representatives that shipments have been delayed on account of the strike, careful investigation shows that this delay is not general and that the iron and steel business has suffered very little. The teamsters' strike is limited to a large extent to the dry goods houses and the wholesale grocery trade with two or three other concerns which do business with those interests. Jobbers in iron and steel are, as a rule, making shipments promptly.

NEWS FROM MANY INDUSTRIES.

New Buyers :—

The Pipe Building Machine Co., Charlotte, N. C., has been incorporated with $100,000 capital stock. The incorporators are: J. W. Conway, W. H. Sneads and H. S. Hall. The objects of this concern are to conduct a general machinery shop and foundry business, and to manufacture and deal in pipe bending machines.

The Independent Gas Light & Fuel Co., Minneapolis, has been incorporated to manufacture gas machines and gas-saving machines. W. G. Sprague is president, L. H. Bowhan, vice president, and F. A. Jacobs, secretary and treasurer. The capital stock is $50.000.

The Fischer & Tesch Mfg. Co., Chicago, has been incorporated with $15,000 capital stock to manufacture steel specialties. The incorporators are: J. B. Fischer, E. A. Tesch and F. J. Fischer.

The Johnson Machinery Co., Utica, N. Y., has been incorporated by J. S. Johnson, L. A. Johnson and E. D. Lee, Utica, with $2,000 capital.

The Wiggins Sad Iron & Foundry Co., Waco, Texas, has been incorporated by O. B. Wiggins, R. D. Powell and J. D. Williamson. The capital stock is $10,000.

The Oregonia Bridge Co., Lebanon, O., has been incorporated with $50,000 capital stock by Thomas R. Spencer, Charles A. Spencer, Frank Brandon, Howard W. Jones and William T. Thompson.

The Janney Mfg. Co., Columbus, O., has been incorporated with $300,000 capital stock. The directors are: G. Campbell Janney, F. T. Crump, Prestin Rider, C. M. Keller and Frank Tillman. Large buildings will be erected at once for the manufacture of machinery.

The Gibson Oat Crusher Co., Chicago, has been incorporated with $10,000 capital stock, to manufacture machinery. The incorporators are: John L. Gibson, Edward D. Green and Robert H. Stoll.

The Odlum Boiler Co., Memphis, Tenn., has been incorporated by R. A. Odlum, W. A. Hein, George R. James, S. M. Neely and M. E. Carter. The capital stock is $75,000. The concern will carry on a general boiler and iron manufacturing business.

The Crescent Iron Works, Norfolk, Va., has been incorporated. The maximum capital stock is $10,000; minimum, $5,000. The incorporators are: C. C. Benjamin, president; J. L. Watson, vice president; A. L. Wormstock, secretary and treasurer. The company will engage in iron-working and machinery repair business.

The Conneaut Shovel Co., Conneaut, O., has been incorporated with $25,000 capital stock by Charles Pott, J. W. Kankonen, M. G. Spaulding, G. M. Brown, Charles Potti and W. E. Masters.

The Ebbing Mfg. Co., St. Louis, has been incorporated by William F. Ebbing, M. J. Clark and A. F. Eickmeyer with $20,000 capital stock. It will manufacture wooden and steel wheels, steel castings, wooden ladders and steel tracks.

The Kewanee Boiler Co., Kewanee, Ill., has increased its capital from $400,000 to $500,000.

The Johnson Machinery Co. New York, has been incorporated to manufacture knitting mill and other machinery. The capital stock is $2,000. The incorporators are: J. S. Johnson, L. A. Johnson, E. D. Lee, Utica; Chas. A. Russell, B. E. Tisdale, Frankfort.

The Elmira Boiler & Iron Works, New York, has been incorporated with $15,000 capital stock. The incorporators are: Henry Hoy, James Hoy, Hugh Hoy and George L. Hoy, Elmira.

The Crawford Sanitary Mfg. Co., New York, has been incorporated to manufacture mill supplies, engines, machinery, plumbing and sanitary fixtures, etc. The incorporators are: W. F. Crawford, Albert Crawford, M. A. McKee, Camden. The capital stock is $50,000.

Reichel & Drews, Chicago, have been incorporated with $2,500 capital stock. They will manufacture, repair and install machinery. The incorporators are: Frederick Drew, Hugo Reichel and Samuel J. Schaeffer.

The Earnest Co. has been incorporated for the manufacture of car brakes and appliances. The capital stock is $50,000 and the incorporators are from West Norfolk, Va.

New Construction : —

The new warehouse of the Phillips & Buttorff Co., Nashville, Tenn., the erection of which was begun several months ago on property adjoining that occupied by its foundry, is now nearly complete, and will be occupied within a short time.

The new foundry of McCarthy & Malanski, Cairo, Ill., is almost complete, and will be occupied within a few weeks. The latest improved Whiting furnace will be installed.

Work has been commenced at New Castle, Ind., on the building to be occupied by John S. Allen and others for a brass and iron foundry and machine shop. The building is 40 x 120 ft., and the plant is expected to begin operations within 90 days.

The Atlas Wire Co., South Bartonville, Ill., has completed the plans for a new brick factory to consist of two buildings, one 60 x 300 ft., and the other 80 x 372 ft. Figures for the erection of the plant are now being taken.

The Santa Fe Railroad plans to enlarge the round house and to establish machine shops at Silsbee, Tex.

The Reidy Foundry Co., Chicago, Ill., is building a new foundry at North Forty-Seventh avenue and Cornelia street after plans by W. L. Stebbins. The building will be large and of irregular ground dimensions. It will cost about $50,000 and will be of brick and iron construction.

The North Wayne Tool Co., Hallowell, Me., has not completed its plans for rebuilding since its recent fire, and has not decided whether it will rebuild at North Wayne or at some other point. The company will necessarily have to buy some equipment, but at present is unable to say to what extent it will be in the market.

B. F. Avery & Sons, Louisville, Ky., are negotiating for the purchase of 50 acres of land to increase their plant, but the plans are not sufficiently matured to justify publication.

The Western Tube Co., Kewanee, Ill., contemplates the erection of an addition to its office. The lowest bidder was the Matthews Construction Co., of Kewanee, and in case the company desires to go forward with the work their bid will be accepted. The decision will be made within 30 days. The addition will be 40 x 96 ft., two stories high.

William L. Barnett, of Boston, will build a drop forging plant near the Bugbee wagon shops, at Easthampton, Mass., and expects to be ready for business Aug. 1. For some years Mr. Barnett was foreman of the drop forging department of the Trimont Wrench Co.

The Belknap Hardware & Mfg. Co., Louisville, Ky., has awarded contracts for the erection of an office building, a warehouse, at Second and Washington streets, Louisville. The cost of the building and equipment is estimated at $200,000.

Acting President Ross, of the Clover Leaf railroad, says the company expects to expend $35,000 in building additional shops at some point along the line.

Tht Paxton & Vierling Iron Works, Omaha, has received a contract from Brandeis & Sons for the structural iron and steel for the new Brandeis mercantile building, at Omaha. There were 11 bidders.

General Industrial Notes:—

The Interstate Engineering Co., Bedford, O., has opened a Chicago office at 706 Fisher building in charge of Edmund G. Fisher. Mr. Fisher is well known in his past connection with the American Steel & Wire Co.

After being assured of $1,500 local capital and that his taxes will be remitted for five years, R. C. Glasgow, of Ingalls, Ind., has made arrangements with the East Des Moines Commercial League to establish a $25,000 post hole factory at Des Moines. The device manufactured is an iron cup from three to four feet deep in which ordinary posts are set before being placed in the ground. They are in great demand by farmers and railroads. Cedar posts set in these iron holes are said to last five times as long as a post set in the ground without the protection from rot which the sheath affords.

The foundry recently erected by L. L. Jackson at the rear of the McLaughlin Iron Works, Ashtabula, O., is in operation. The cupola is of 2,400 pounds capacity, and the blast is driven by a gas engine. The floor is 25 by 50 feet in size and the space thus provided is sufficient to accommodate eight men. It is expected to take off a heat each day, if business warrants.

The Mary Furnace of the Ohio Iron & Steel Co., Lowellville, O., has been blown out for repairs, and considerable new equipment will be added. This will consist of a new 44 x 84 x 60 in. vertical long cross head blowing engine built by the William Tod Co., Youngstown. A new casting house, 50 x 180 ft., equipped with a traveling crane for the economical handling of pig iron will be built and a complete new hearth and bosh and lining are to be added to the furnace, as well as a number of modern improvements that are believed will increase the output of the stack to about 450 tons per day.

The George's Creek Coal & Iron Co., Baltimore, has contracted for the purchase of 300 additional steel cars to meet the demands of its steadily growing trade. The new cars will cost about $285,000.

As reported in the issue of June 1, the Nordberg Mfg. Co., Milwaukee, has leased the foundry of the William Bayley & Sons Co. It secured possession long before the last named company became bankrupt.

The Baldwin Forging & Tool Co., of Columbus, O., recently incorporated, will in the near future begin the manufacture of shovels and a considerable line of drop forgings.

The Dayton Pneumatic Tool Co., Dayton, O., has opened an office in San Francisco, at 421 Market street, and will be in charge of Henry Engels.

The name of the Imperial Foundries Co., of Calais, Mass., has been changed to the McAdamite Foundries Co.

The United Shoe Machinery Co. has declared the regular quarterly dividend of 2 percent per share on its common stock and 1½ percent on its preferred stock, payable July 15 to stock of record June 29.

Schedules in the assignment of the Charles Creighton Foundries Co., New York, show liabilities of $25,863.00, nominal assets of $21,236.00, and actual assets of $9 ?03.00.

The Buckeye Pump & Mfg. Co. has recently started business in Columbus, O., for the manufacture of an automatic water lift pump, the invention of J. C. Howard, who was associated with B. H. Fobes. The factory of the company is at 36-42 West Lafayette street, and the offices are in the Outlook building, Columbus.

The Ohio Fittings Co., Akron, O., has been granted a charter to do business in Oklahoma. The principal incorporators are: Elmer E. Billings, of Barberton, O., and J. M. Coulson, of Akron.

A petition was filed in the United States District Court, at Trenton, N. J., by Isaac J. Greenwood, of New York; Charles F. Hickey, of Brooklyn, and Frank L. Crocker, of New York, praying that the Philadelphia Iron & Steel Co., a New Jersey corporation, be placed in bankruptcy. Judge Lanning issued a rule to show cause why the company should not be adjudged bankrupt.

Charles C. Wetherly, for 30 years with the firm of Weatherly & Pulte in charge of the furnace department, has severed his relations with that company and will engage in the furnace business for himself at Grand Rapids, Mich.

Charles H. Wacker, president of the Chicago Heights Land Association, states that the recent location of the Columbia Tool Steel Co. and the Morden Frog & Crossing Co. have created an unprecedented demand for dwellings, and he fully expects 4,000 people to be added to the population of that city this year.

The Llewellyn Iron Works, of Los Angeles, Cal., is building a steam oil storage tank, 130 ft. in diameter, 15 ft. high and 10,000 barrels capacity.

Meyer & Goldberg, dealers in scrap iron, Milwaukee, Wis., have filed a petition in bankruptcy. Liabilities are scheduled at $10,413.08 and assets of $1,731.86 of which $1,000 is claimed as exempt.

Steadily Branching Out.

The James Ohlen & Sons, Saw Mfg. Co., Columbus, O., has rebuilt after their recent fire and are now operating with a capacity of high grade saws greater than ever before. The factory was founded in 1852 and along in the 80's became an incorporated company. Along in the years of 1897 and '98 it began to feel the need of more extensive factory, consequently moved from the old quarters on Spring street to a point on the Neil Switch between Buttles and First avenues, Columbus O. Since that it has found it necessary on several different occasions, in fact almost each year, to build additions to the plant in order to take care of the growing trade. Last year the company put up a splendid two story building, five of the rooms devoted to offices and the balance to packing and storage purposes. The concern is now completing one of the best band saw plants in the country and is executing orders at a very rapid rate. The hand and cross cut trade is handled on quite an extensive basis, that part of the business being manufactured in an adjoining town under company supervision and brand. The export trade of this company is taken care of at 118 Liberty street, New York City, under the firm name, where, also, it takes care of trade in the New England States.

It has been found necessary almost every month during the past twelve to install some new machinery. A large new lathe is being placed in operation now to take care of some of the growing demands for many side lines, such as gong whistles, mandrels, saw gummers, swedges, lever jacks, saw guards, saw guides, and many other specialties. About the first of the present year a branch was established at Atlanta, Ga., where Southern trade receives prompt and efficient service. This company is officered by T. J. Keating as president, J. J. Chester as vice president and general counsel, and A. C. Armstrong as secretary and treasurer, and L. W. Seymour as general manager.

The Chattanooga Sewer Pipe & Fire Brick Co., Chattanooga, Tenn., announces that that company, and the plants formerly owned by D. P. Montague, have been incorporated under the firm name, and business will be conducted in the future as it has in the past.

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GRAFTING IN BUSINESS.

Apparent defeat is sometimes real victory and there can be little doubt that, in spite of the fact that the report of the Frick investigating committee was rejected by a majority vote of the directors of the Equitable Life Assurance Society, the adjustment of the unfortunate troubles of that great organization now nearly completed, was due to a very large extent to the thorough investigation and forcible truth telling of the committee presided over by the master mind of Henry C. Frick.

To have assisted in bringing about the reorganization of a great insurance company, in which many thousands of policy holders are interested was indeed rich reward for Mr. Frick and his associates, but we believe that the report will have much more important and far reaching effects than to change the organization of the Equitable, for at least some of the sins of the Equitable are common to many companies, whose members can not fail to appreciate the lesson of the investigation into its affairs. In the development of tremendous business interests, there has been a deplorable tendency to get away from old fashioned ideas of honor and when the Frick committee says "there is a general lack in the organization of that strong moral fiber so essential for the accomplishment of satisfactory results," those who pretend that in business and war all things are justifiable may well ponder and also reflect upon the following paragraph of the report:

> The general policy of the society having been diverted from its true course, it is hardly to be wondered at that there is found throughout its official personnel a sort of moral obliqueness—a condition where personal gain seems to be at times the paramount idea.

Two practices of the Equitable which are open to severe criticism, that of electing directors on account of their social, political or business prominence and requiring them to give almost no time to the discharge of their duties, for which they were paid large salaries, and that of allowing officers to purchase securities in the market and sell them to the Equitable through a committee of which they were practically the only members, are not unknown to some other business concerns. The old idea that a director should be familiar with the business which he attempted to direct and give enough time to the discharge of his duties to enable him to do so efficiently and not to hold stock in any concern whose interests might conflict with those of the company which he served as director has become obsolete in many places. There are too many wheels within wheels. In public life, the office holder who is financially interested in contracts for which he votes is called a grafter and when caught and convicted, is sent to jail. In business life the man who engages in similar practices, the man who is false to a trust because he is determined to get rich, is too often called a shrewd gentleman and given additional responsibilities and honors. In public life, the offenders can be punished by law; in the business world, dependence must be placed almost entirely on individual conscience and the cultivation of a sentiment which will just as surely condemn the business man who is false to his trust as it will the boodler in politics.

EIGHTEEN HOURS, NEW YORK TO CHICAGO.

Sometimes a disposition is shown to regard the establishment of new fast railroad trains as prompted partly by a desire of the management for "advertising." These reductions in schedules represent progress by both the railroads and the public, and it is not always easy to recognize progress. The advancement in railroading is shown by the fact that it is now not measurably more difficult to establish an 18-hour schedule between New York and Chicago than it was in former years to establish 24 and then 20 hour schedules. The business interests of the country have become more important as shown by the expectation that enough men can be found to pay the excess fare for a business day saved between these points to support the new service notwithstanding the fact that the telegraph and the telephone are continually working, in their way, to reduce the necessity for traveling.

A measure of improvements made by the Pennsylvania railroad system in the past three years is furnished by its establishment of the new 18-hour train. It will be recalled that in 1902 both the Pennsylvania and the New York Central-Lake Shore routes put on 20-hour trains; the Pennsylvania soon discontinued its train on account of the congestion in traffic; the other route was able to continue its service. Now the Pennsylvania restores the train, on a schedule two hours shorter. Its improvements in three years have made an 18-hour schedule feasible where three years ago a 20-hour schedule was not feasible.

The reason the congestion which interfered with the Pennsylvania service in 1902 does not exist now is not because there is less business; there is more. The change is in the facilities. In 1904, the Pennsylvania Railroad Company showed, on the lines directly operated east of Pittsburg, a decrease of only $1,269,977, or 3.37 per cent. in net earnings from 1902; in tons of freight carried one mile it actually showed an increase in the two years of 199,253,078, or 1.42 per cent.; in passengers carried one mile it showed an increase of 52,912,672 or 4.54 per cent. While the lines east showed an increase in passenger and freight traffic from 1902 to 1904, they showed a decrease from 1903 to 1904, there having been an increase from 1902 to 1903. The lines west did still better, since they showed increases from 1903 to 1904, of only a fraction of a percent in freight, but of nearly 11 percent in passenger traffic.

Stress is here laid upon facilities for handling traffic because that is the desideratum for these high speed trains. A portion of the track must be open absolutely, by running the other trains on other tracks, or placing them in yards or on sidings. It is these requisites which have been provided in the past three years. Yards have been enlarged, new yards have been established, long sidings have been installed and additional main line track has been laid.

In the mere matter of speed the best American railroads have for years been able to meet all the contingencies which were allowed by the other conditions. No improvement was here necessary. Indeed, the Pennsylvania route, New York to Chicago via the Trenton cut-off is 897 miles, which at 18 hours gives an average speed of 49.83 miles per hour, while on the preliminary experimental run there were several individual hours on which more than 70 miles were covered, and on the first schedule run three miles were covered in 85 seconds, or at the rate of 127.3 miles an hour, breaking all world's railway speed records.

It would appear, therefore, that American roadbeds and rolling stock are capable of much greater speeds than the duties of the roads, other than running fast passenger trains, permit. Abroad, however, there is something of a feeling that American railroads are not capable of the speeds which are common in England and on the continent. Before the recent International Railway Congress at Washington, a paper was read on steel rails for fast lines, from which it would appear that on some foreign roads ideas have been adopted which have not gained a foothold on this continent. Nevertheless it appeared than on the American trunk lines the weight of rail was generally heavier than abroad. The favorite practice abroad of inclining the rail inwards, giving the web a departure from the vertical of about one in 20, does not prevail in the United States.

When the time comes, therefore, for American roads to run still faster trains, they will be able to meet the demand. To prevent a business day from elapsing in a journey between New York and Chicago was a distinct achievement; there will be other such in the future.

THE NEW STEEL STATISTICS.

The full summary of 1904 statistics presented this week by the American Iron and Steel Association contain some minor statements which have not heretofore been presented. The production of pig iron, Bessemer and open-hearth steel, rails, etc., has been made public already.

The production of crucible steel in 1904 is shown to have amounted to only 83,391 gross tons, which is the smallest production since 1897. The record production was 112,772 gross tons, in 1902. It is obvious that the increased demand for steel for such purposes as formerly called exclusively for crucible steel, should call for a heavier production, had not other varieties of steel come to be used for certain purposes. For years it has been held that the acid open-hearth steel furnace could produce steel of good enough quality to meet the bulk of the demand which was formerly met by crucible steel. In some quarters the surprise may be more that the crucible process has shown such vitality, than that it has not had a greater expansion.

There will probably be some surprise that the production of tin plate and terne plate is returned at only 458,000 gross tons in 1904. The production of tin and terne plate has been as follows:

1891	999	1898	326,915
1892	18,803	1899	360,875
1893	55,182	1900	302,665
1894	74,260	1901	399,291
1895	113,666	1902	360,000
1896	160,362	1903	480,000
1897	256,598	1904	458,000

The disappointment at the tin plate production in 1904 can only be relative. While it shows a decrease from 1903, it shows otherwise a very large increase over previous years, being 15 percent in excess of the previous record, made in 1901. There was more activity at the tin plate works in 1904, relative to production of tin plate, than there was in 1903, because the production of certain fine sheet steel increased. This product, used for enameling and other purposes, is a natural output for the tin mills. A tin mill, in trade parlance, is a rolling mill which produces steel sheets in a certain style and with a certain finish. The tinning or not of the product has come to be really simply an incident.

The bringing together of 1903 and 1904 statistics shows an interesting development of the wire industry as compared with the rail industry. The comparison is:

	1903.	1904.
Wire rods	1,503,455	1,699,028
Rails, all kinds	2,992,477	2,284,711

Rods increased; rails decreased. In 1903 rods were 50.2 percent of rails; in 1904 they were 74.3 percent. The relation increased almost one-half. Rod production will pass rail production in a few years, from the present outlook.

Discussion at the American Foundrymen's Convention.

THOMAS D. WEST ELECTED PRESIDENT.

Cleveland will Probably be the next place of Meeting—Dues Reduced.

Before its close, the convention of the American Foundrymens' Association, held in New York, June 6-7-8, elected Thomas D. West, Sharpsville, Pa., as president for the ensuing year. Dr. R. Moldenke was re-elected secretary and treasurer. It was also practically decided that Cleveland would be the city in which the next convention would be held.

DR. MOLDENKE.

Much good work has been accomplished by the Association in the past year, especially along the line of standardization practice, and its plans for the coming year are very ambitious. The proposal made at the meeting held at Indianapolis, 1904, to interest the patternmakers in the work of the Association, has borne good fruit, and before the meeting last week closed a Patternmakers' Section was organized with H. J. McCaslin, of Wellman-Seaver-Morgan Co., Cleveland, as president, and William H. Parry, of the National Meter Co., Brooklyn, N. Y., secretary. The Associated Foundry Foremen have also under advisement the question of admitting patternmakers to membership in their various "locals." At the next convention, it is proposed to organize a brass founders' section.

In the adoption of standard methods, the Association, through its metallurgical section, has recommended a standard for the determination of silicon in pig iron and cast iron which will be found elsewhere in this report, and will soon have ready a formula for determining the total carbon.

The committees on pattern insurance, coke tests, sand beds, trade schools, etc., are continuing their investigations and labors, with the most excellent results to the foundry trade in general. Two new committees were authorized at the recent meeting, one to look into the feasibility of standardizing flasks, and the other to report from time to time on plans for the standardization of patternshop-foundry practice.

Before the close of the convention, a motion was adopted to reduce the annual dues from $10 to $5, charging all alike.

Paper by W. J. Keep.

Our report of last week ended with an account of the business session of the first day's meeting of the American Foundrymen's Association. The first paper taken up Tuesday morning was that of W. J. Keep, Detroit, Mich., on "Blowers, Piping and Cupolas at the plant of the Michigan Stove Co." This provoked considerable discussion, and Mr. Keep was kept busy for several minutes answering questions.

KEMP, THE SAND MAN.

L. G. Blunt, of the Westinghouse Electric & Mfg. Co., Pittsburg, asked if Mr. Keep had noted the oxidation of silicon and carbon in the cupola at the melting ratio he mentioned, and whether he had kept any record of the losses. Also if he found by varying the amount of fuel and blast whether a cheaper grade of pig iron could be used. Mr. Keep replied that they had made some very accurate tests on a week's work on the melting losses only. He called attention to the fact that in a stove foundry he found it very difficult to keep any record of the losses, mentioning that they swept the foundry every night; picked up all the scrap, riddled the sand and extracted the chippings, etc. Every day's record was kept by itself, so that they knew absolutely all the time what they were doing. In this way, he found that there was about 4½ percent loss from all sources. The loss of silicon was only about ¼ of 1 percent, and the carbon loss very slight.

W. A. Jones of Chicago wanted to know what cupolas Mr. Keep used, and was told that they were of the old cylinder type. The same gentleman also asked if any data had been kept as to a comparison between the outlet of the tuyeres and the capacity of the blast pipe. He was informed that the area of the tuyeres is about two and three times as large as that of the blast pipe.

David Spence of the Greenlee Foundry Co., Chicago, asked the size of the tuyeres as they enter the cupola. Mr. Keep answered that in their No. 3 cupola the tuyeres are almost continuous. Nos. 1 and 2 cupolas, he added, have tuyeres 4½ in. x 7 in., each cupola being equipped with sixteen.

The paper by J. B. Nau, New York City, entitled "Notes on Pipe Foundries and Suggestions of Metal Mixers for Foundry Purposes," was next read. No discussion followed.

Retort Coke Melting Ratios.

C. M. Schwerin, of the Milwaukee Coke and Gas Co., Milwaukee, Wis., followed with his paper on "Notes on Retort Coke Melting Ratios." This was an interesting paper to the foundrymen and caused considerable discussion. L. G. Blunt of Pittsburg asked, if by increasing the quantity of coke on the charges from one to ten to one to seven, in both cases

THOS. D. WEST.

putting in a good bed, whether a cheaper grade of pig iron could be used. Mr. Schwerin's answer was that after a certain amount of coke had been put in there was no gain, but that for very light work by pouring the iron hot, it had less tendency to take a sand chill. "It is true," he continued, "that a softer grade of iron can be used when running a high bed and keeping the melting points up than if the melting points were allowed to go too near the tuyeres by running a low bed or not putting sufficient coke on the charges, as the blast will oxidize the iron, making it harder."

This discussion was followed by the paper of Ellsworth M.

Taylor, Boston, on "Production Costs." Mr. Taylor's remarks were heartily applauded in a speech by David Spence of Chicago, who told of the methods of keeping track of the costs in vogue at the plant of which he is superintendent. Further discussion on this paper was reserved for Thursday morning, and will be found in the account of the proceedings of that session.

Henry M. Lane's paper, on the "Making of a Molder," which was on the program for Wednesday afternoon, was read and discussed Tuesday morning. The paper will be found elsewhere in this issue.

In the discussion that followed, August T. William, Philadelphia, told the convention that the firm with which he is employed undertook some time back to put into operation a plan to educate the boys and men in its employ along the lines suggested by Mr. Lane, and that the attempt was a signal failure. Mr. William was of the opinion that the influence of labor unions upon apprentices destroyed in a large measure the efforts of the employer in his educational work. The fact also that so many concerns confined their shops to the manufacture of specialties prevented the teaching of the molder's trade in all its details. To make a competent workman, this speaker thought that manufacturers should adopt a plan by means of which a boy could, after learning all the details of the work in the shop of his first employer, be transferred to another shop where a different product was made.

CALEY'S CONFAB WITH SMITH.

L. G. Blunt told of the technical school maintained by the Westinghouse Electric & Mfg. Co., at Pittsburg, for the benefit of its employes, the instructors in which were the best engineers in the employ of the company. In this institution, three classes are maintained. One of two years, one of three years and one of four years. The first mentioned is intended for college graduates, and is a sort of post graduate course; the second is for boys and men that have had a common school education, and the four-year course for those whose education has been very limited. The latter students pass through every department of the electrical company's works, learning the details of each thoroughly. Finally, they reach the dynamo test department, which is the senior class. By this time, they have received an excellent training in the manufacture and operation of electrical machinery and can be classed as first-class workmen.

American Warrant System.

The session Tuesday afternoon was opened with a talk on "The Latest Developments of the American Pig Iron Warrant System for Foundry Use," by George H. Hull, of New York. At its conclusion, President Wolff turned the meeting over to the Associated Foundry Foremen, vacating the chair to C. H. Thomas, president of the section. After a brief speech by Mr. Thomas and the reading of the secretary's report, a synopsis of which was given in last week's issue, the paper of Benjamin D. Fuller, Allegheny, Pa., the title of which was "Needed in the Business," was taken up.

No discussion following, David Spence, Chicago, was called upon to deliver his talk on "Things We Need in the Foundry," the gist of which was that foundrymen instead of cutting one another's prices should aim to make the very best quality of castings possible and exact a good price for them. Mr. Spence characterized cutting prices as one of the greatest evils the foundry business has to contend with, involving as it did, poor work and slovenly methods in general.

The paper on "The Use of Plaster of Paris in the Foundry," by Edward B. Gilmour, Peoria, was next taken up, and was followed without discussion by the two papers prepared by

C. H. THOMAS.

Archibald M. Loudon, Elmira, N. Y., entitled, "A Simple and Economical Method of Molding Propeller Wheels, and "A Successful Foundry Combination." At the conclusion of the former paper, one of the men asked Mr. Loudon if he knew of any case where plaster of paris had been used as a match for a big pattern, and was told that it would be too expensive.

Other papers read at this session were those prepared by H. E. Field, of Mackintosh, Hemphill & Co., Pittsburg, on "Fan and Blower Tests," and of W. W. Sly, of Cleveland, on "The Economy of Recovering Shot Iron from the Foundry Dump Heap."

Wednesday Morning.

The main lecture room of the chemical laboratory of Columbia University was well filled when President Wolff called the meeting to order. Dr. Moldenke welcomed the assembly in behalf of the institution, of which he is an alumnus. He spoke of the aims and methods of the university, referring to the practical work which forms an important part of the curriculum and which renders the services of its graduates valuable at once upon graduation. In the course of his remarks, he said: "All that a university can teach is how to learn, and it is that training which gives the college-bred man an advantage in the affairs of life."

F. W. Stickle, of Waterbury, Conn., opening the discussion of the paper on "Fan and Blower Tests," read on the previous day by H. E. Field, Pittsburg, inquired whether the time of tapping the slag had been the same in both tests, and whether the volume of air had been sufficiently uniform to insure the same conclusions.

Mr. Field replied that the work had been performed by trained men and that everything possible had been done to render the test absolutely correct. The volume of air had not been measured.

Mr. Stickle remarked that the catalogue figures of manufacturers did not always agree with the actual volume of air furnished by their machines, and that in some cases the claims were purposely made lower than measurements seemed to warrant. The power necessary to melt a given quantity of iron depended very largely upon the time required. He had found that while a certain volume of air is necessary, it is possible to double the output by increasing the volume furnished. The increased resistance due to rising temperature might also increase the power required very materially. In his opinion unsatisfactory results were very often due to failure to supply a sufficient volume of air. The best policy was always to melt the iron as rapidly as possible.

C. M. SCHWERIN

David Spence, of Chicago, asked about the number of ounces of pressure employed in the tests, and spoke of the influence of the physical properties of the coke upon the melting process. He had found that with a relatively light coke the melt proceeds more rapidly, apparently because the carbon is consumed more readily than is the case with a denser fuel. Referring to a custom of beginning the operation with 10 ounces blast pressure and increasing to 16 ounces, he personally believed that quite as rapid work could be done by keeping the pressure uniformly at 12 ounces.

Foundry and Pattern Shop Standards.

William H. Parry, Brooklyn, N. Y., read his paper at this meeting on "Foundry and Pattern Shop Standards," in which he urged the adoption of measures to secure greater uniformity in the matter of dimensions, drafts, spindles, etc.

E. M. TAYLOR.

H. M. Lane, of Cleveland, said that he had for some time been trying to find out whether anything had been done towards the standardization of flasks. He had written a number of letters and had received many interesting replies. It had been suggested that the Association take the matter up. Some rational standards for snap flasks, pins and pin holes are especially desirable. He thought that what had been done in the case of standardizing the size of machine catalogues might also be done in foundry practice.

E. B. Gilmour, Peoria, Ill., suggested that the matter presented fewer difficulties than appeared at first sight.

Dr. Moldenke proposed that a committee be appointed devoted entirely to the interests of the pattern-maker, a committee to report from time to time on standardization of patternshop-foundry practice. The motion was adopted. A second motion for similar action for the standardization of flasks aroused considerable discussion.

Benj. Fuller, Allegheny, Pa., said it would be difficult to tie down the foundryman to standard flasks. Flasks must be of such form as to accommodate the pattern. W. H. Parry disclaimed any intention to dictate as to size and shapes, but he saw no reason why something could not be done to eliminate odd sizes, sometimes involving differences of small fractions of an inch. August T. William endorsed Mr. Parry's remarks. He said it was often necessary to change the flask for the molding machine every time a new pattern was used. Chas. J. Caley, Bridgeport, Conn., suggested that the motion be limited to flasks of certain sizes only. F. W. Stickle, Waterbury, Conn., believed in standardization in every way possible. He said that foundrymen had trouble enough without a lot of odd flasks. Eugene W. Smith, Chicago, thought that a standard in even inches could be set to which machine men could agree in time One of the worst features of modern practice was, in his opinion, too much crowding of flasks.

The motion to provide a committee to look into the standardization of flasks prevailed.

W. H. PARRY.

H. M. Lane, Cleveland, gave a brief synopsis of his paper on the "Care and Storage of Patterns."

W. M. Carr of the Goldschmidt Thermit Co., New York, entertained the assembly with a practical demonstration of the use of thermit. He described the different kinds of this product, the variety used for ordinary welding being a mixture of metallic aluminum and iron oxide. When ignited, the oxidation of the aluminum produces an intense heat, in ordinary quantities approximating 5000 degrees F. or 300 degrees C., the iron oxide being reduced to the metallic form. In order to show the intensity of the heat produced, a quantity of the material was ignited and the products of the reaction allowed to flow upon an iron plate, one inch thick, burning a hole through it instantly. A second experiment was a butt-weld of two sections of two-inch pipe. In the discussion which followed, Mr. Carr explained a number of interesting details connected with the manipulation of thermit. The reaction as ordinarily carried out produces about 50 percent of a mild form of steel containing about .1 percent of carbon derived from the graphite of the crucible. Nickel thermit is employed for the introduction of a definite quantity of nickel into cast iron or steel. About ½ per cent of nickel in cast iron kettles increased the resistance to acids and alkalis to a marked degree. The demonstrator explained that while it was possible to use thermit in welding cast iron, it was in this case necessary to employ a larger proportion of the material than with steel.

A paper by G. N. Prentiss, Milwaukee, Wis., on thermit practice closed the morning session.

Wednesday Afternoon.

After partaking of a luncheon served in the University Commons and enjoying an hour's stroll about the beautiful campus and laboratories, the members reassembled to consider and discuss a number of papers, several of which were illustrated with stereopticon views.

"The Variation of the Properties of Alloys," by Percy Longmuir, Sheffield, England, contributed by *Metal Industry*, and read by Dr. Scholl, was illustrated by lantern slides. The author described a number of experiments to determine the effect of varying conditions at the time of casting upon the proportions of the alloys cast. The alloys tested were various combinations of copper, tin, zinc and metals used alone. One of the deductions of the experiments is that too high or too low a temperature produces a decidedly inferior casting.

J. B. NAU.

The description of "The Use of Thermit in a Railroad Shop," by James F. Webb, Elkhart, Ind., was also accompanied by a number of interesting lantern views.

Microscopic views of a large number of well known varieties of core sands were a feature of a paper on "Core Sands," by J. S. Robeson, Camden, N. J. The author made clear that the occasional failure of cores prepared with any given binder was frequently due to the character of the core sand employed. He gave a number of successful formulae and related several experiences in which a slight modification of the mixture converted vexatious failures into conspicuous successes.

A discussion which caused more or less amusement concerned the possibility of casting cylinder jackets with cores without vents. One member remarked that it was all he could do to make cylinders of that kind with vents, to say nothing of vent-less cores. The gentleman to whom the original claim that the thing could be done (P. M. Baumgardner, president The Holland Linseed Oil Co., Chicago) had been ascribed, failed to appear, and the discussion died for lack of opposition.

Thursday Morning.

With the exception of a discussion of about half an hour's duration on the paper read by Ellsworth M. Taylor of Boston, on "Production Costs," the meeting Thursday morning was devoted entirely to the election of officers for the coming year, and to the transaction of new and unfinished business. Mr. Taylor was given the opportunity by the president to answer any questions on the subject of his paper which any of the members might be interested in asking. Following the lead of August T. William of Philadelphia, the discussion took the line of whether it was advisable to keep a detailed system of the costs connected with the manufacture of small castings. The opinion prevailed among the foundrymen who participated

in the discussion, and was coincided in by Mr. Taylor, that in a great majority of cases it is neither practicable nor advisable to attempt to do this; that where very small castings are concerned it is better to get a fair average cost and charge accordingly. A periodical check on the cost of manufacturing such castings every one or two years would be sufficient to keep the price in line. Mr. Taylor thought it would be a saving to the proprietor if such labor was put on the piece basis.

JONES, OF CHICAGO.

After the discussion ended, the convention voted its thanks to Mr. Taylor, on motion of Mr. William, for the very able manner in which he had answered the questions asked.

Metallurgical Report.

The report of the metallurgical section was next read by H. E. Diller, secretary, which is as follows:

During the past year your committee has formulated a method for determinating the silicon in cast iron, and is now at work on the question of the total carbon. The following is the method which your committee recommends to be the standard of the association, for the determination of silicon in pig iron and cast iron:

"Weigh one gramme of sample, add 30 c. c. nitric acid, (1.13 sp. gr.); then 5 c. c. sulphuric acid (conc.). Evaporate on hot plate until all fumes are driven off. Take up in water and boil until all ferrous sulphate is dissolved. Filter on an ashless filter, with or without suction pump, using a cone. Wash once with hot water, once with hydrochloric acid, and three or four times with hot water. Ignite, weigh, and evaporate with a few drops of sulphuric acid and 4 or 5 c. c. of hydrofluric acid. Ignite slowly and weigh. Multiply the difference in weight by .4702."

In recommending the above method, it was recognized that it is almost an impossibility to get chemists to use a standard method in their daily work. Hence the above method, as recommended, is intended primarily as a check method in case of dispute between different laboratories, or as between buyer and seller.

Hence a method, accurate in every point was sought, shortness being sacrificed to some extent to insure accuracy or the chance of error by a careless operator. Little in the above is left to the judgment of the chemist.

It will be further recognized that in the purchase and sale of pig iron or castings under specification, that standard methods are essential in order to allow the parties of both parts to make their determinations with the assurance that, on the score of method, they are on the same footing.

Miscellaneous Business.

Under the subject of new and unfinished business, Dr. Moldenke brought up the question of reducing the dues of the Association. He suggested this step not only as an inducement to increase the membership, but because he felt that since the discontinuance of the Journal the members were not getting full value for the $10 they were paying. To bring the matter to some sort of conclusion, he made a motion that the dues be reduced to $3 per year. This proposal was not favorably received and after some discussion the original motion was amended to make the annual dues $5, with the proviso that this amount be charged to members of the different sections as well as to members of the Association. This was carried.

Following this action, the Association voted its thanks to Columbia University, to the contributors of the papers read, to the foundry supply men and to the entertainment committee.

The nominating committee, composed of W. A. Jones, of the W. A. Jones Foundry & Machine Co., Chicago, Ill.; J. P. Golden, Golden Foundry and Machine Co., Columbus, Ga.; George H. Lincoln, Lincoln Foundry Co., Boston, Mass.; C. H. Thomas, president of the Foundry Foremen's Section, and A. V. Slocum, National Car Wheel Co., Pittsburg, which was appointed at the Tuesday morning session, was called upon for its report.

In proposing Mr. West's name for president, the chairman of the committee, W. A. Jones, spoke in high praise of Mr. West's services to the association and of his work as an investigator and contributor of original articles on foundry practice. He said: "As chairman of the nominating committee, I am pleased to state that the Association has thought it wise to select at each of its conventions a gentleman whose home is the city in which the convention will next convene. In this way, the president will preside in his own city. This presents many advantages and as far as can be seen few disadvantages. And working with this end in view, it affords me great pleasure to place in nomination for president of this Association a gentleman whom you all know, a gentleman who is well known throughout this country where foundry interests are known or even discussed; whose books and papers have a national reputation, and a gentleman who perhaps more than any other person excepting alone, Dr. Moldenke, has done more and worked harder for the interests of this Association."

FOUNDRYMEN AND GUESTS AT A. F. A. MEETING.

The secretary was instructed to cast the vote of the convention for the election of Mr. West as president and for the election of the other candidates presented for the offices named. This was done and W. A. Jones and C. H. Thomas were appointed to escort Mr. West to the chair.

The customary expressions of appreciation and thanks for the honor were made by the incoming and outgoing officers, and following the precedent established at the first meeting,

C. H. Wolff, the retiring president, was made an honorary member of the Association.

The vice presidents elected for the ensuing year are as follows: *New England States,* Harry A. Carpenter, A. Carpenter & Sons, Providence, R. I. *New York and New Jersey,* H. Van Atta, Sup't J. L. Mott Iron Works, New York. *Penn., Delaware, Maryland and District Columbia,* A. V. Slocum, National Car Wheel Co., Pittsburg. *Michigan, Ohio, Kentucky, Tennessee,* A. K. Beckwith, estate of P. B. Beckwith, Dowagiac, Mich. *Indiana, Illinois, Missouri, Kansas, Colorado, Arizona, New Mexico, Utah, Nevada and California,* David Spence, Greenlee Foundry Co., Chicago. *Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Idaho, Nebraska, Wyoming, Washington and Oregon,* Adam Bair, superintendent of foundry, C. M. & St. P. Ry., Milwaukee, Wis. *Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma and Texas,* J. P. Golden, Golden Foundry & Machine Co., Columbus Ga. *Canada,* T. J. Best, Warden, King & Co., Montreal.

W. J. KEEP.

Foundry Foremens' Section.

Chairman, David Reed, (Canadian Westinghouse Co., Hamilton, Can.).

Sec'y, F. C. Everitt, J. L. Mott Iron Works, New York.

Metallurgical Section.

Chairman, R. S. MacPherran, J. I. Case, Threshing Machine Co., Racine, Wis.

Sec'y, H. E. Diller, Western Electric Co., Chicago.

Patternmakers' Section.

Chairman, H. J. McCaslin, Wellman-Seaver-Morgan Co., Cleveland.

Sec'y, Wm. H. Parry, National Meter Co., Brooklyn, N. Y.

Auditing Committee.

J. S. Seaman, S. H. Stupakoff and Wm. Yearll, all of Pittsburg.

Invitations to hold the 1906 convention in Cleveland were received from the mayor, chamber of commerce, foundry foremen's society and several large manufacturing interests of that city, and were read by H. M. Lane of Cleveland.

Philadelphia and Toronto also asked for the next convention, the invitation from the former city coming from the Philadelphia Foundrymen's Association, and to the latter city from L. L. Anthes, of the Toronto Foundry Co., the only Canadian present at the convention.

The meeting adjourned, and in the afternoon the members visited the works of the International Steam Pump Co., Harrison, N. J.

Excursion to Harrison, N. J.

About a hundred of the members and guests of the Association set out from hotel headquarters Thursday afternoon to visit the great plant of the International Steam Pump Co., at Harrison, N. J., under the guidance of Dr. Moldenke and Mr. Lane. Clear skies and brilliant sunshine made up for the disagreeable weather of the earlier days of the convention.

At the works the delegation was received and conducted about the establishment by representatives of the firm, and the busy scenes in and about the foundries, some familiar and others suggestive of improvements in home plants, were, to many, a welcome change from the hustle and bustle of New York streets.

A feature of the visit was another demonstration showing the most approved method of applying nickel thermit to cast iron in the ladle. The discovery of intricate castings made with cores without vents, vindicated the gentleman whose statement that jacketed cylinders could be cast without vents was received with incredulity during Wednesday's sessions.

Those in Attendance.

Crivel, Geo. F., F. B. Stevens, Detroit.
Hessler, Geo. J., Syracuse Fdry. Co., Syracuse, N. Y.
Hill, J., The Hill & Griffith Co., Cincinnati.
Jacobs, F. D., The Osborn Mfg. Co., Cleveland.
Brown, L. S., Springfield Facing Co., Springfield, Mass.
Golden, J. P., Golden Foundry & Machine Co., Columbus, Ga.
Blau, L. G., Golden Foundry & Machine Co., Columbus, Ga.
Lane, H. M., editor *The Foundry,* Cleveland.
Blunt, L. G., Westinghouse Foundry, Pittsburg.
Thompson, Frank, T. P. Kelly & Co., New York.
Frohman, H. F., The S. Obermayer Co., Cincinnati.
Frohman, E. D., The S. Obermayer Co., Pittsburg.
Moldenke, Dr. R., Secretary American Foundrymen's Association, Watchung, N. J.
Johnston, S. T., The S. Obermayer Co., Chicago.
Smith, J. S., J. D. Smith Fdry. Supply Co., Cleveland.
Gilmour, E. B., Globe Foundry Co., Peoria, Ill.
Lafever, M., Advance Thr. Co., Battle Creek, Mich.
Hutton, W. W., Advance Thr. Co., Battle Creek, Mich.
Wolff, Chris. J., L. Wolff Mfg. Co., Chicago.
William, A. T., Enterprise Mfg. Co., Philadelphia.
Kaye, Ellsworth, J. S. McCormick Co., Pittsburg.
Wilke, F. A., General Electric Co., Schenectady, N. Y.
Knapp, L., Stiles Foundry & Supply Co., Parkersburg, W. Va.
McCormick, J. S., J. S. McCormick Co., Pittsburg.
Eagan, D. F., Pridmore Moulding Machine Co., Boston.
McLaren, John, Philips & McLaren, Pittsburg.
Jones, W. A., W. A. Jones Foundry & Machine Co., Chicago.
DeWolfe, W. H., P. & F. Corbin, New Britain, Conn.
Schilling, Jos., Russell & Erwin Mfg. Co., New Britain, Conn.
Mills, J. F., Abendroth Bros., Portchester, N. Y.
Vanderford, Asa, Crescent Iron Works, Springfield, Mo.
Loudon, Arch. M., Elmira Heater Co., Elmira, N. Y.
Caley, H. L., Hart & Crouse Co., Utica, N. Y.
Gilbert, H. W., N. Y. C. & H. Ry. Foundry, Frankfort, N. Y.
Langdon, Palmer H., *The Metal Industry,* New York.
Burgen, J. J., Lane Mfg. Co., Montpelier, Vt.
Malone, T. E., J. S. McCormick Co., Pittsburg.
Stone, H. H., Penn. R. R., Altoona, Pa.
Bougher, J. K., J. W. Paxton Co., Philadelphia.
Bernhard, B., Garwood Foundry, Garwood, N. J.
Taggart, Edward M., J. W. Paxton Co., Philadelphia.
Gartside, W. N., Diamond Clamp & Flask Co., Richmond, Ind.
Mather, Edward, Maher & Flockhart, Newark, N. J.
Lambert, Edward J., Syracuse Chilled Plow Co., Syracuse, N. Y.
Findley, A. L., *Iron Age,* New York.
Danziger, J. L., chemist, New York.
Keep, W. J., superintendent Michigan Stove Co., Detroit.
Moorehouse, W. S., A. S. Cameron Steam Pump Works, New York.
McNeal, G., Garden City Sand Co., Chicago.
Pangborn, Thos. W., Thos. W. Pangborn Co., New York.
Cooledge, Edward R., Thos. W. Pangborn Co., New York.
Pangborn, John C., Thos. W. Pangborn Co., New York.
Hazeltine, Reginald, Magee Furnace Co., Boston.
Bean, W. R., The T. H. Synington Co., Corning, N. Y.
Bean, A. P., The T. H. Synington Co., Corning, N. Y.
Bair, A. W., Wis. C. M. & St. P. Foundry, Milwaukee.
Sherman, Wm. J., Bethlehem Steel Co., Bethlehem, Pa.
Griffiths, Geo. H., *The Iron Trade Review,* Chicago.
Rider, I. G., Frick Co., Waynesboro, Pa.
Gilbert, L. D., Frick Co., Waynesboro, Pa.
Nicol, Jas., Iron & Brass Works, Sandy Hill, N. J.
Cherrie, Jas., Friction Pulley & Machine Works, Sandy Hill, N. J.
Spence David, Greenlee Foundry Co., Chicago.
Matthews, C. D., Camden Iron Works, Camden, N. J.
Carr, W. M., Goldschmidt Thermit Co., New York.
Smith, Eugene W., Crane Co., Chicago, Ill.
Waldorf, Henry J. Eaton, Cole & Burnham Co., Bridgeport, Conn.
Quinn, Hugh T., Eaton Cole & Burnham Co., Bridgeport, Conn.
Murphy, Hallet M., Eaton Cole & Burnham Co., Bridgeport, Conn.
Thomann, Chas., Crosby Steam Gauge Co., Boston.
Bullard, H. W., Poughkeepsie Foundry & Machine Co., Poughkeepsie, N. Y.
McClintock, A. E., National Founders' Association, Detroit.
Hodges, C. E., Utica Heater Co., Utica, N. Y.
Waldron, M. D., Utica Heater Co., Utica, N. Y.
Lincoln, Geo. H., Geo. H. Lincoln & Co., Boston.
Winlock, J. P., Barbour Stockwell Co., Cambridge, Mass.
Thompson, A. M., Link Belt Machinery Co., Chicago.
Lord, Henry F., Lord & Burnham Co., Irvington-on-Hudson.
Bradford, Jas., Lord & Burnham Co., Irvington-on-Hudson.
Taylor, Ellsworth M., Library Bureau, Boston.
Colvin, C. H., Colvin Foundry Co., Providence.
Clark, A. L., American Brake Shoe & Foundry Co., Mahwah, N. J.
Sayles, N. W., American Brake Shoe & Foundry Co., Mahwah, N. J.
Brewer, W. M., Colonial Foundry & Machinery Co., So. Norwalk, Conn.
Baumgardner, P. M., president Holland Linseed Oil Co., Chicago.
Diller, H. E., Western Electric Co., Chicago.
Hooper, G. K., Con. Engineer, New York.
Anderson, N., Matthew Addy & Co., New York.
Foster, W. C., M. J. Drummond & Co., New York.
Stearns, Geo. H., Walker & Pratt Mfg. Co., Boston.
Blythe, Robert, Walker Mfg. Co., Boston.
Savage, Wm. F., Smith & Anthony Co., Boston.
Tutein, E. A., Crocker Bros., Boston.
Beckwith, A. K., Beckwith Estate, Dowagiac, Mich.
Schroeter, J. A., Western Foundry Co., Chicago.
Overton, C. J., The Winkle Co., Hartford, Conn.
Nanert, Herman, Ridgeway Dynamo & E. Co., Ridgeway, Pa.
Webb, Jas. F., Lake Shore R. R., Elkhart, Ind.
Hockley, Rupert R., Abendroth Bros., Portchester, N. Y.
Marceau, L. E., Abendroth Bros., Portchester, N. Y.
Stutz, E., vice president Goldschmidt Thermit Co., N. Y.
Thompkins, S. D., Smooth On Mfg. Co., Jersey City.
Googins, C. E., Smooth On Mfg. Co., Jersey City.
Burns, John C., Pond Pool Co., Plainfield, N. J.
Hubbard, Geo. A., Chicago Flour Co., Chicago.
Reid, David, Canadian Westinghouse Co., Hamilton, Can.
McCaslin, H. J., Wellman-Seaver-Morgan Co., Cleveland.
Warren, D. C., *The Foundry,* New York.
Fisher, Harriet, Eagle Anvil Works, Trenton, N. J.

Schwenn, Chr., Milwaukee City Coke & Gas Co., Milwaukee.
Graham, W. M., N. Y. Green Fuel Economizer Co., Matteawan, N. Y.
Knoeppel, John C., Oswego, N. Y.
Knoeppel, Frank W., Oswego, N. Y.
Sly, W. W., The W. W. Sly Mfg. Co., Cleveland.
Hirschheimer, L. C., La Crosse Plow Co., La Crosse, Wis.
Beverly, T. L., Cohoes Iron Foundry Machine Co., Cohoes, N. Y.
Logan, J. A., Jones & Laughlin Steel Co., Pittsburg.
Fitzpatrick Co., Wm. H., The S. Obermayer Co., Pittsburg.
McFadden, W. H., Mackintosh, Hemphill & Co., Pittsburg.
Field, H. E., Mackintosh, Hemphill & Co., Pittsburg.
Miller, A. J., Whitehead Brass Co., Providence.
Thomas, D. J., Sterrit Thomas Foundry Co., Pittsburg.
Fuller, Benj. D., Westinghouse Electric Co., Pittsburg.
Sleeth, S. D., Westinghouse Air Brake Co., Pittsburg.
Watt, Stewart, Watt Mining Car Wheel Co., Barnesville, O.
Walker, Arthur W., Walker & Pratt Mfg. Co., Boston.
Slocum, A. W., National Corundum Co., Pittsburg.
Hutton, C. E., Watt Mining Car Wheel Co., Barnesville, O.
McCartney, J. T., Watt Mining Car Wheel Co., Barnesville, O.
Burr, John W., The Burr & Houston Co., Brooklyn.
Norton, Jas. H., The Burr & Houston Co., Brooklyn.
Pennewill, E. E., Abram Cox Stove Co., Philadelphia.
Anthes, L. L., Toronto Foundry Co., Ltd., Toronto, Can.
Hudson, J. M., president Piqua Flour Co., Piqua, O.
Gilbert, H. P., Piqua Flour Co., Piqua, O.
Gunn, John K., Utica Pipe Foundry Co., Utica, N. Y.
Schaffer, J. H., National Corundum Wheel Co., Buffalo.
Trimble, F. W., Whiting Foundry Equipment Co., New York.
Brown, L. K., L. K. Brown Moulding Sand, Zanesville, O.
Weeks, S. C., Lorain Steel Co., Johnstown, Pa.
Weeks, A. B., Cambria Steel Co., Johnstown, Pa.
Keegan, J., United Eng. Foundry Co., Pittsburg.
Stehman, John V. R., Birdsboro Foundry & Machine Co., Birdsboro, Pa.
Kelly, T. P., T. P. Kelly & Co., New York.
Morse, H. R., The W. W. Sly Mfg. Co., Cleveland.
Stafford, Wm. H., Gibby Foundry Co., Boston, Mass.
Walker, Geo. B., Whitehead Bros. Co., New York.
Lindsay, E. C., W. W. Lindsay & Co., Philadelphia.
Fasy, Jos. L., W. W. Lindsay & Co., Philadelphia.
Thompkins, Vreeland, Smooth-On Mfg. Co., Jersey City, N. J.
Lyon, E. J., Browne-Sharp Mfg. Co., Providence.
Hamilton, Wm., Newport News S. B. & D. D. Co., Newport News, Va.
Roedell, W. A., Kennedy Valve Mfg. Co., Coxsackie, N. Y.
Fraser, John, Mackintosh, Hemphill & Co., Pittsburg.
Dette, W. S., The Arlington Co., New York.
Newcomb, F. F., Crocker Bros., New York.
Tatlock, W. L., Rand Drill Co., New York.
Caley, Chas. J., Russell & Erwin, New Britain, Conn.
Raucheeberg, E. C., Wheeling Molding & Foundry Co., Wheeling, W. Va.
Pridmore, Henry E., Henry E. Pridmore, Chicago.
Turnbull, R. E., Henry E. Pridmore, Chicago.
MacDougalt, D., National Meter Co., New York.
Kanavel, N. E., Interstate Land Co., Cleveland.
Jones, J. E., M. H. Treadwell, New York.
Perry, Walter, Farrell Foundry & Machine Co., Ansonia, Conn.
Adamson, Robt., Farrell Foundry & Machine Co., Ansonia, Conn.
Beckett, Jas. A., Hoosick, Falls, N. Y.
Touceda, Enrique, Albany, N. Y.
Smith, M. Sheldon, Globe Foundry Co., Portchester, N. Y.
Schade, G. C., Braddock Machine Mfg. Co., Pittsburg.
Tabor, Harris, Tabor Mfg. Co., Philadelphia.
McCardell, Andrew, Pond Machine & Tool Co., Plainfield, N. J.
Brant, W. J., Chicago Flour Co., Pittsburg.
West, Tho. D., T. D. West Fdry Co., Sharpsville, Pa.
Davie, Jas., Acme Foundry Co., Brooklyn, N. Y.
Meighan, John A., John A. Meighan, Pittsburg.
Chapman, Eugene M., Wm. M. Crane Foundry Co., Peekskill, N. Y.
Bowe, Jas. J., Eddy Valve Co., Waterford, N. J.
Fenwinkle, W. A., Electric Controller & Supply Co., Cleveland.
Gilmour, J., Foundry Equipment, New York.
Mumford, E. A., E. A. Mumford Co., Philadelphia.
Pettinos, Geo. A., Pettinos Bros., Bethlehem, Pa.
Pettinos, Chas. E., Pettinos Bros., Bethlehem, Pa.
King, F. W., Corrugated Grinding Wheel Co., Philadelphia.
Vanatta, H., J. L. Mott Iron Works, New York.
Stickle, F. W., Manufacturers' Foundry Co., Waterbury, Conn.
Grunan, Wm. F., Erie City Iron Works, Erie, Pa.
Fisher, S. H., Harrisburg Foundry & Machine Works, Harrisburg, Pa.
Meeker, David M., Meeker Foundry Co., Newark, N. J.
Smith, F., Nelson Valve Co., Philadelphia.
Perrine, W. A., Abram Cox Stove Co., Philadelphia.
Everitt, F. C., J. L. Mott Iron Works, New York City.
McQuillin, W. S., Colonial Foundry & Machinery Co., South Norwalk, Conn.
Folant, W. S., Colonial Foundry & Machinery Co., South Norwalk, Conn.
Martin, Geo. H., Rand Drill Co., Ossining, N. Y.
Thomas, Chas. H., Associated Foundry Foremen, New York City.
McPhee, H., Eaton Cole & Burnham Co., Bridgeport, Conn.
Lent, Thos. K., Wm. M. Crane Co., Peekskill, N. Y.
Wadsworth, Geo. H., Falls Rivet & Machine Co., Cuyahoga Falls, O.
Reese, John, Falls Rivet & Machinery Co., Cuyahoga Falls, O.
Brown, Aug. W., Abendroth Bros., Portchester, N. Y.
Williams, Sidney M. A. & B. Brown Co., Elizabeth, N. Y.
McLean, E., Penn. R. R., Altoona, Pa.
Cunningham, W. P., American Bridge Co., Philadelphia.
Young, James, Penna. R. R. Co., Altoona, Pa.
Steele, W. O., Bateman Mfg. Co., Grenloch, N. J.
Parry, W. H., National Meter Co., Brooklyn, N. Y.
Gorman, J. W., Ridgeway Machine & Tool Co., Ridgeway, Pa.
Dorman, Robert, Garwood Machine Co., Garwood, N. J.
Sickels, W. H., A. A. Griffing, Jersey City, N. J.
Reardon, W. J., Westinghouse Foundry, Pittsburg.
Bell, Daniel, Dominion Coal Co., Glace Bay, N. S.
Robeson, J. S., American Glutrose Co., Camden, N. J.
Smith, P. C., Ingersoll-Sergeant Co., Easton, Pa.
Jones, D., Barnett Foundry Co., Newark, N. J.
Gow, John, General Elec. Co., Schenectady, N. Y.
McPhee, L., Eaton Cole & Burnham Co., Bridgeport, Conn.
Kemp, Simon, Molding Sand, Catasauqua, Pa.
Scholl, Geo. P., The Metal Industry, N. Y.
Dancer, J. C., General Electric Co., Schenectady, N. Y.
Cushing, Geo. H., and Turney, Jas., H. B. Smith Co., Westfield, Mass.
Ayers, E. M., Zanesville, O.
McKenna, Chas. J., New York City.
Millett, E., Millett Core Oven Co., Springfield, Mass.
English, W. C., *The Iron Age*, Boston.
McPhee, N. H., Eaton Cole & Burnham, Bridgeport, Conn.
Lincoln, T. M., Hartford Fdry. Corp., Hartford, Conn.
Bartlett, S. L., Elizabeth, N. J.
McLeod, Robt., Newark, N. J.
Crawford, Robt., S. L. Moore & Sons Co.
Juliem, J. Henry, J. W. Paxson Co., Philadelphia.
Taylor, J. A., Port Chester, N. Y.
Mills, C. E., C. E. Mills Oil Co., Syracuse, N. Y.

Business Opportunities Abroad.

Consul General Richard Guenther, at Frankfort, Germany, in his report to the Department of Commerce and Labor reports the following business opportunities as having come to his notice:

Argentina.—The Empresa del Ferrocarril del Sur, in Buenos Aires, will purchase a large number of freight cars and other railroad rolling stock. The Direccion General de Obras de Salubridad de la Nacion, in Buenos Aires, will receive proposals for erecting works to supply water to Catamarca. Estimated cost, $416,094.

Austria-Hungary.—The Austrian naval arsenal at Pola will receive bids for supplying four steam boilers. Specifications can be obtained from the war department at Vienna. The municipality of Prerau will build a number of electric tramway lines. The Banca Cooperativa, in Trieste, is financing a new tramway line which is to run between Riva and Trent.

Germany.—Extensive works for manufacturing briquets (pressed coal blocks) are to be erected at Emden by the Rhenish-Westphalian coal trust.

Ireland.—The port and docks board of Dublin will receive bids for constructing an electric power station.

Japan.—The Japanese navy department proposes the erection of a briquet (pressed coal) manufacturing plant on an extensive scale, to utilize the coal dust of the Yamaguchi mines.

Mexico.—The Compania Hidro-Electrica queretana has received a concession from the Mexican Government to utilize the Rio de San Juan del Rio for electric purposes. The erection of a dam and large power station is projected.

Norway.—Styrelsen's Expeditions-Kontor, in Christiania, wants to purchase 1,700 tons of steel rails and other railroad materials.

Spain.—The Junta de Obras del Puerto, at Almeria, will expend $1,000,000 on harbor improvements.

Sweden.—The city of Malmoe is to issue a loan of $1,890,000, to be expended on public works, among which is a dry dock 500 feet in length. The city of Stockholm is negotiating a loan of $13,400,000, which is to be spent in public improvements.

Switzerland—The cantons of Schwyz and Zurich contemplate the construction of works for utilizing the water of the Sihl River for the creation of electric energy.

Belgium.—Bids for building a viaduct are invited by the Société Nationale des Chemins de fer Vicinaux at Brussels.

Brazil.—The city of Nictheroy has resolved to install electric lighting, and will build two market halls and a public bathing establishment.

Bulgaria.—The Government of Bulgaria contemplates the purchase of 5,000 plows for Bulgarian agricultural associations.

Denmark.—The city of Copenhagen contemplates building a floating dock for the largest vessels.

The Birdsboro Steel Foundry & Machine Co., of Birdsboro, Pa., has opened an office at 718 Real Estate Building, Broad & Chestnut streets, Philadelphia, and has placed J. P. Warfel in charge. Mr. Warfel has represented the company in that section for sometime and has met with great success.

The Scranton Meeting of the American Society of Mechanical Engineers.

The Scranton meeting of June 6-9 was excellently arranged and the accompanying excursions as well as the equally pleasurable features of the professional sessions were thoroughly enjoyable and provided in such lavish measure that some ingenuity was essential to complete participation. A severe storm swept over southern New York on the Monday night immediately preceding the convention, and the following Tuesday and Wednesday were given frequent showers of rain. The remainder of the week was much more favorable to full enjoyment of the outdoor program provided for the entertainment of the visitors and quite satisfactory weather conditions prevailed.

TUESDAY'S SESSION.

At the initial meeting on Tuesday evening the meeting was called to order in the auditorium of the Y. M. C. A. building by the chairman of the local committee, William F. Mattes. He apologized for the absence of Mayor Connel, of Scranton, who had been unable to attend owing to a previous engagement. The committee, however, had obtained in the absence of the mayor a fitting substitute in Col. F. L. Hitchcock, of the Scranton Board of Trade, who said: "The world is fond of men who do things. No one can estimate how much the world is indebted to the gentlemen of your profession. I imagine that if it were possible for the old heroes of the past to arise and see the great successes of their successors they would be satisfied. The finest figure, to my mind, in the history of the world is George Stephenson opening wide the throttle of that little locomotive, the Rocket, in the test before a committee of judges. I would rather have been a George Stephenson driving that little locomotive at thirty miles per hour over an old-time strap-rail road than any other man that ever lived. In welcoming you members of the American Society of Mechanical Engineers to our city let me inform you that Scranton is not a city which has behind it centuries of age. Your society is older than the city in which you are assembled. This city is but thirty-nine years of age. When it was incorporated, a newspaper in a neighboring city made the remark that it was supremely ridiculous that a flag station on the Lackawanna road, surrounded by a wilderness, should be incorporated as a city. We then had 20,000 inhabitants. In the past twenty-five years we have paved twenty-four miles of streets and have built eighty miles of sewers. We extend to you the glad hand of a vigorous, energetic youth and welcome the brainy men constituting your society. We hope your stay will be a pleasant one."

E. M. Zehnder, president of the Scranton Engineers' Club, extended the greetings and hospitality of a young engineering society and offered his hearers a hearty welcome.

W. F. Mattes pointed out that the welcome now extended by him and his associates was not confined to the city of Scranton. Mr. Rood, of Hazleton, at one of the committee meetings had said: "This is not a Scranton proposition, it is an anthracite affair." Mr. Mattes continued: "On behalf of our committee I extend to you a welcome which is as long and as deep as the coal measures of our valley and as high as our culm heaps. You are at liberty to fill your pockets with culm and your badges will be sufficient protection for your safety."

President John R. Freeman in acknowledging the cordial reception of the society, said in part: "I was one of the fortunate members who visited this city seventeen years ago and we then had the same chairman of the general committee. We had a very enjoyable meeting and having the same officers now we are assured of another meeting which will be fully as satisfactory. This meeting bids fair to be one of the best in the history of the society. The two hundred already registered are but the vanguard of larger numbers and it is regrettable that all cannot hear these kindly words of welcome

Scranton a Pioneer.

"I am reminded that seventeen years ago we were invited to witness here the success of the first electric road in the United States. We had misgivings about entering an electric car with a good watch, the powerful motors and surrounding electric apparatus being a possible source of injury to the timepiece. There were many discussions that day as to whether it would be safe to visit the power house with a valuable watch. It is interesting at this time to review the crudeness of the ideas upon electricity even then. There is an important matter relative to that test in this city. Just at that time we had a committee in Boston, my old town, considering traction systems and they had a leaning to the cable. Plans were being made for the cable road when the promotors heard of the success of the electric road in Scranton and as a result they sent their engineers here to investigate the project. Upon the return of the experts to Boston, the surveying corps for the proposed cable road was disbanded and an electric road was planned. This was the beginning of the great system of electric roads in Boston. During this seventeen years we have had the steam turbine, the gas engine and centrifugal pumps commercially developed.

"Your city is one of contrasts. Here you have side by side lace mills, silk mills and the great anthracite industry. We have every reason to believe this will be one of the most interesting and instructive gatherings of the society. We are interested in Scranton furthermore because you have in your city an institution which is doing great work in the training of young men for machine shops and other industries. I refer to the International Correspondence Schools. In one machine shop in Providence I am informed that there are two hundred men who were pupils of these schools. Scranton therefore is recognized widely as a great center of education and a most useful kind of training.

"In closing let me say that Scranton was the home of a dear friend, an apprentice of Mr. Mattes. I refer to Major Louis Seymour. He came to Boston and erected the engine designed by E. D. Leavitt, past president of this society. His work in South Africa carried the fame of the American engineer into that country. He was chief engineer of the Rand Mining Co. and when work was suspended owing to the outbreak of war, he organized an engineer regiment to rebuild bridges which had been blown up. He was a man whom everyone honored once they had met him. In him the society lost one of its most promising members and I shall always think the more of Scranton because it was the home of my friend, Louis Seymour."

Prof. Hutton read communications from the Scranton Club and from George G. Mabie, general secretary of the Scranton Young Men's Christian Association, tendering the house privileges of their respective buildings. Secretary Hutton also intimated that this was one of the meetings where every author got his paper in the hands of the society in due season so that thirty days ahead of the convention the papers could be sent out to the membership. The authors were deserving of much praise on this account. It had enabled discussions to come from members in England and some discussions had been set up in type for the study of the members.

A paper on the "Transfer of Heat at High Temperatures" had been prepared by Frank C. Wagner, of Terre Haute, Ind. The paper was read in abstract by the secretary in the absence

of the author. The paper deals with some experiments made several years ago for commercial purposes and the primary object of these investigations was to determine the time required to raise plates of iron and steel to a welding temperature in an open-hearth regenerative furnace. The samples of metal were cut from stock plates used in the manufacture of butt weld pipe. The temperature was measured by a Le Chatelier thermocouple. A number of tables are submitted with the paper.

The secretary, in the absence of F. E. Matthews, of New York presented an abstract of his paper on a "Standard Unit of Refrigeration." This paper had been considered by the society's committee on refrigeration matters and it was hoped that it might have the effect of bringing out further information in the discussion. W. D. Ennis, of Everett, Wash., submitted the following criticism: "In paragraph II, page, 6, Mr. Matthews assumes the specific heat of anhydrous liquid ammonia between zero and 90 degrees Fahr. to be 1.2345. What is the authority for this value? Von Strombeck (Jour. Frank. Inst., Dec., 1890) found a mean value of 1.22876 between 62 degrees and 31 degrees Centrigrade. Ludeking and Starr (Am. Jour. of Science, III, 45,200) report .886. Professor Wood (Thermodynamics, seventh ed., page 337) deduces the value 1.093 at a temperature of 34 degrees Fahr. below zero; the same authority gives for the specific heat of the liquid at any temperature T degrees Fahr., 1,096 — .0012 T (Trans. A. S. M. E., X, 645) and, at a later date, 1.12136 + .000438 T (Trans. A. S. M. E., XII, 136) Ledoux gave the formula 1.0058 + .003658 t, in which t is the temperature, Centigrade. In 1897, the late Mr. L. A. Ellean and the writer made nine determinations of the specific heat at temperatures between zero and 20 degrees Centigrade (Jour. Frank. Inst., April, 1898). The values obtained ranged from 983 to 1.056, the average being 1.02. The probability of error in this or any previous determination is so large that two decimal figures are all that can be asserted with precision. It would appear that the value of the specific heat varies quite widely with the temperature; although so wide a variation as exists between the figures of Von Strombeck and Ludeking and Starr seems improbable. The value used by Mr. Matthews seems to be higher than any that has previously been calculated or determined by experiment. The value of the specific heat of the liquid is not a large factor in calculations in refrigeration; but no correct table of evaporative factors is possible without it, especially as its ratio to the latent heat is about double that of water to its latent heat, and its variation with the temperature is large."

A paper on "The Formation of Anchor Ice and Precise Temperature Measurements" by Dr. Howard T. Barnes, of McGill University, Montreal, Canada, had been presented at one of the monthly meetings of the society in New York. It was now, in the absence of the author, read in abstract by the secretary. It describes a study of the formation of frazil ice. An instrument for this work required to be very sensitive to heat changes and the one devised for this purpose depended upon the change in resistance of platinum wire. It was probably the most delicate differential instrument yet made. This thermometer had a degree which was eight inches long and it was practicable to estimate by this means to the ten-thousandth part of a degree. The tables given in the paper indicate that the margin between the disintegration of the ice and the formation of the ice is exceedingly narrow, only a few thousandths of a degree.

Centrifugal Pump Development.

A paper of a high degree of interest, historical and otherwise, dealt with "Some Types of Centrifugal Pumps" and had been prepared by Wm. O. Webber, of Boston, Mass. Mr. Webber says: Centrifugal pumps were known as early as the seventeenth century. Papin, the celebrated French engineer, designed a centrifugal pump in 1703. Euler brought out a pump of this type in 1754. In 1818 a form of centrifugal pump was brought out in Massachusetts, U. S. A., known as the Massachusetts pump. In 1830 a Mr. McCarthy erected a pump in the New York navy yard which was credited to have approached the efficiencies of the present day. In 1846 Andrews produced pumps of this type, and about this same time John and Henry Gwynne, of England, commenced the manufacture of centrifugal pumps as a commercial enterprise. Appold exhibited a model of a centrifugal pump at Birmingham in 1849, and at the Crystal Palace Exposition in London in 1851, Appold's pumps were an important feature. All of the pumps above referred to were pumps in which there was a single impeller or runner. Some of these pumps had the suction upon one side only, and some, like the Massachusetts and Gwynne pumps, had double suction inlets or openings on either side of the pumps. All of these pumps were made for comparatively low lifts and large quantities of water, and were not productive of very high efficiencies. From 46 percent to 60 percent seems to have been the best results obtained with pumps of this type under heads varying from 4½ to 15 ft. Forty feet was considered the maximum height at which centrifugal pumps could operate efficiently, and Mr. Webber's experiments, conducted in 1874, 1875 and 1876, seemed to demonstrate that the highest efficiency in the single stage pump was found at a height of about 32 ft., and a maximum velocity of the liquid being pumped through the discharge orifice of the pump of not exceeding 12 ft. per second. In Appold's experiments he determined that the efficiency mainly depended upon the form of the blades in the impeller or vane and the shape of the volute or enveloping case, and that the best form for the blade was a curve, pointing in the opposite direction to that in which the impeller revolved, and for the case, that of a spiral tapering type or volute. The first engineer who seems to have discovered the value of compounding centrifugal pumps—that is, by causing the discharge of one centrifugal pump (either integrally formed or simply in close juxtaposition) to be led into the suction of another similar pump—was the celebrated Swiss engineer, Sulzer, of Winterther, Switzerland. Sulzer was pretty closely followed by A. C. E. Rateau, of Paris, and John Richards and Byron Jackson, of San Francisco, Cal. All of these pumps were constructed originally with the impellers facing in one direction, and the consequent thrust upon the impellers was partially taken up by balancing chambers upon the rear of each impeller. This form of balancing was further improved in Rateau's pump by a balancing cylinder at the extreme discharge end of the pump shaft, into which water was admitted from the discharge orifice of the pump. Rateau further attempted to improve the balancing of his pump by constructing inclosed impellers, having one of the side plates of the impellers of smaller diameter than the other, so that the area of the two impeller side plates subjected to the discharge pressure from that impeller was equal. John Richards also used a balancing piston at the discharge end of the pump, directly connected with the discharge pressure, and also attempted to further balance a pump of this type by exhausting the air from one side of the impeller and forcing air in upon the other side. Sulzer then made the greatest step in the balancing of compound pumps by placing the impellers back to back in pairs, so that one impeller thrust in one direction and the next impeller thrust in the opposite direction. The method which he used, however, of conveying the liquid being pumped from one impeller to the next required short, tortuous passages, he utilizing the fixed guides in the whirlpool space of the pump to form these cross-over passages; also, it is believed, that to Sulzer we are indebted for the idea of introducing the guide blade or turbine element.

The author believes that he is the first one to design an absolutely balanced compound centrifugal pump, by causing the impellers to be placed back to back, but not in pairs serially deposed; and in producing results, from the method in which he sequentially connects the different impellers, so that both the sum and difference of the suction and discharge pressures

of all the impellers in any compound centrifugal pump equalize and balance each other.

Mr. Webber submits some formulae found in practice to check closely with results obtained by other observers on tests of similar pumps. In conclusion he avers that the multiple-stage centrifugal pump therefore offers a practical solution for pumping impure liquids to great heights or against great pressures, easily and economically, as in mines for pumping water containing all kinds of foreign materials for fire pumps to maintain a sufficient number of the fire streams indefinitely. Certain combinations of multiple-stage pumps can be readily made to pump a quantity of water to a certain height to start a barometric condenser and then twice the quantity to one-half the original height after the siphon action of condenser is established to maintain the necessary vacuum at a constant speed of pump. Other adaptations allow of maintaining a variation of pressures on hydraulic elevators at a constant speed of pump to vary the speed of elevators to accommodate variations in the demands for service during the different hours of a day, or discharging under several different pressures for varying services or to varying heights for similar purposes. In fact, the variations to be obtained by this class of pump seem to be indefinite and only limited by the demands for service and the ingenuity of the designer in making combinations of the different stages, consequent upon a multiplicity of impellers. This type of pump has come to stay and offers a solution for sinking pumps in deep workings, for submerged pumping, for auxiliary pumps for water works, and many other combinations where electrical driving will allow of operating at a distance and without local attendance. They are also, from their extreme simplicity, absence of valves, etc., as nearly impossible of getting out of order and as nearly "fool-proof" as it is possible to make modern machinery. They occupy a minimum amount of space, can be operated in any position, can be made infinitely strong, do not get out of repair readily and can be repaired easily and the working parts renewed readily at a minimum expense.

Pump Possibilities

F. W. Henshaw, of New York, was of opinion that Mr. Webber's paper is a timely contribution as the possibilities of centrifugal pumps are beginning to receive general recognition. The new types designed on the multiple stage principle extend the working range of this class of machinery to such an extent that we are no longer confined to reciprocating pumps for moderate and high heads. Possibly the most important result of this development is that of increased facility in the use of electric power for pumping. In driving reciprocating machines the valuable characteristic of the uniform rotary torque of the electric motor becomes naturally a positive disadvantage. Certain speed limits are imposed on electric motors by reason of cost and efficiency. These limits are much higher than the corresponding speeds of reciprocating pumps, hence double reduction gearing is often required. Pumps with less than three cylinders are not suitable for electric drive, and even with that number the jar is objectionable. The centrifugal pump, on the contrary, lends itself perfectly to the speeds and characteristics of the electric motor, and by variation in the number of stages it would seem possible to meet most if not all conditions of speed and head with economy and convenience Available data on the efficiency of multiple stage centrifugal pumps are at present incomplete. Enough is known, however, to indicate that with its other advantages the centrifugal or turbine pump stands a fair chance of entirely superseding the reciprocating pump for general work in lifting water. It has even a possibility of competing with the most efficient steam machine known, viz.: the high duty waterworks pumping engine, by reason of its low cost and the indirect advantages due to its adaptability to electric power. Consider a water supply system having a number of pumping stations in which are electric centrifugal pumps driven from a central station through high tension power lines. Against the reduced "duty" in such a system there would be all the advantages of concentrated steam plant at the most desirable location, steam turbines, ability to combine in the same station power supply for municipal or general lighting and traction, and small cheap pumping stations which could be made nearly automatic. There are certainly conditions under which such a system should receive serious consideration. In this age of "mergers," electric power in the engineering field is like the powers of Wall street in another field; it tends to merge things, but unlike the latter, takes but a small percentage for its services. In further reference to pumping systems, he would ask Mr. Webber if centrifugal pumps have been used or considered for oil pipe lines? Such pumps would seem well adapted to the work unless the pressures and the nature of the fluid prevent. For example, it would be interesting to know whether the agitation of the fluid by the impellers would prevent the deposit of wax in the passages of the pump. An obvious advantage of such pumps for this work is the ability to isolate the pump from its driving power simply and efficiently, thus reducing fire risk.

High Duty Pumping in 1884.

Charles N. Trump, of Wilmington, Del., found no mention in this paper of a plant designed by a member of the society, the late John H. Cooper. This was the centrifugal pumping plant at the Mare Island Navy Yard, California. The dock nearing completion in 1884 required an adequate pumping equipment to promptly expel its seventy-nine million gallons of water. To this end proposals were issued by the United States Government for a pair of centrifugal pumps with a discharge of 80,000 gallons per minute, a drainage pump with an average delivery of 2,000 gallons per minute, together with the necessary pipes, valves, etc., including propelling engines, bed plates and full "equipment for operating the same." No general plans or details were furnished. The plant was to be delivered and erected in a house to be prepared by the Government, beside the dock, to which steam would be conveyed from boilers furnished by the department. This contract, awarded to the Southwark Foundry & Machine Co., of Philadelphia, bears date, July 31, 1884, and to John H. Cooper was intrusted the entire formulation of the design and the conception and arrangement of its details Two 42-in. centrifugal pumps—each pump directly connected with an engine having steam cylinder, 28-in. diameter, 24-in. stroke—were installed, for emptying the great bulk of water from the dock. One 8-in. centrifugal pump—its engine with steam cylinder, 12-in. diameter, 10-in. stroke—was put in for completing the discharge and for continuously removing water of infiltration from the dock. The two main pumps were tested together by the board appointed for that purpose, April 20, 1886. As quoted by Mr. Cooper, their report reads: "During a pumping period of 55 minutes the dock had been emptied from the twenty-third to two inches above the sixth altar, containing 6,210,698 gallons, an average throughout of 112,698 gallons per minute. At one time, when the revolutions were increased to 160 per minute, the discharge was 137,797 gallons per minute. In practice it would be impossible to secure a vessel in the dock—so rapidly was the water removed—at the time of trial, and it is without parallel in the world that so large a dock, with its 7,000,000 gallons of water, has been emptied in fifty-five minutes. One pump will do all that is required to empty the dock in use, and then it will require short work to properly shore the vessel, to replace the rapidly receding water. . . . Indication cards taken at various intervals gave 796 horsepower for the main engines. The revolutions did not exceed 160 at any time, though it was estimated that 900 horsepower and 210 revolutions would be necessary to attain the requisite delivery." Test of the engine-driving drainage pump developed 32 h. p., steam pressure 55 lb. per sq. in., 350 r. p. m. This pump gave records beyond requirements of contract, and did all its work under extreme head, 35 ft. The plant was afterwards duplicated by the Southwark Foundry & Machine Co., at Pensacola, Florida.

H. H. Suplee had seen these pumping engines in Philadelphia and was shown them by Mr. Cooper. One of the difficulties that had seemed at one time quite formidable had been the matter of shipment. An old coal car was used and remodeled to carry the load within practicable distance of the rails or the bridges of the railroads. In reference to the best shape of impellers, a member of the Victorian Society of Engineers, Australia, had made some interesting experiments. These had demonstrated that the best form of impeller was nearly radial. The investigation was carried on with pumps in transparent cases. These were supplied with colored water and the action depicted on a screen. The subject was further discussed by Messrs. C. R. Rarig, C. C. Wilson, Fred. Ray, Rice and Morse. In closing, President Freeman intimated that the best turbine had been built by the patternmaker and the man of gumption and not by the formulae manufacturer. He paid tribute to the value of experiment, the cut and try method, and recalled with approval that the first piece of apparatus put into Mr. Webber's plant at Lowell was a testing weir.

WEDNESDAY MORNING.

Secretary Hutton made announcement of an engineering congress to be held at the Lewis and Clarke Exposition from June 17 to July 1 of the present year. This congress will be under the auspices of the Pacific Association of Engineers, this comprising the Northwestern Society of Engineers and the Technical Society of the Pacific Coast. The American Society of Mechanical Engineers will probably be formally represented by some member to be designated by the president. C. W. Hunt, of the committee on the Union Engineering building, made a brief verbal report of progress in reference to the twenty-six plans submitted to the committee. The examination had been quite thorough and critical and the members of the committee were of opinion that they had secured the best work in sight. Especial care had been taken with the auditorium. This will seat a thousand people and accommodation will be provided for consulting rooms, etc., immediately adjacent for the benefit of members in attendance at the meetings. On the 20th of the present month contractors' bids will be opened and the work promptly begun thereafter. The structure will be 90 ft. deep by 100 ft. front and will have a height of 210 ft. Engravings showing the architectural features will be distributed about June 20.

President Freeman said that the question of locating the next spring meeting of the society had already received attention and at a meeting of the council the day previous, Newell Sanders, of Chattanooga, Tenn., had made a convincing argument for that city. He invited Mr. Sanders to repeat his successful effort at this time. That gentlemen was not then within hearing but on entering the hall later he genially responded to the invitation and submitted anew the claims of the South for a convention of this type. The president had been to Chattanooga with a sister society and added his cordial support to the assertions of southern hospitality and good will.

A Veteran Honored.

The Council of the Society announced through the president, John R. Freeman, that Charles H. Haswell had been elected to honorary membership. Mr. Haswell has passed his ninety-sixth birthday and his robust health gives good promise for the future. He bids fair to round out the century. H. H. Suplee had picked up at an old book store in New York a copy of the first edition of Mr. Haswell's pocket book for engineers. This particular copy had on the flyleaf an inscription from its author to "my friend, John Erickson." This was indeed something of a discovery and Mr. Suplee proposed to present the book to the library of the society. It was additionally noteworthy as being the published work in 1846 of an author now living.

Passing to the reading of professional papers, the secretary briefly submitted the gist of a contribution entitled "Microstructure and Frictional Characteristics in Bearing Metals," from Prof. Melvin Price of the University of Nebraska at Lincoln, Neb. This was a consideration of the law of variation of the amount of friction with the velocity of sliding, other conditions being constant; the theory of Charpy and others regarding the function of the hard grains and of the plastic ground mass in the microstructure of alloys, and the theory of Prof. Goodman relative to the effect produced by elements of high atomic volume as distinguished from the effect of those of low atomic volume in bearing alloys. The author presents an extensive investigation, begun at Columbus University. The author submits his work with considerable diffidence as may be seen by his own discussion presented at the reading of the paper. Prof. Price hoped that all very positive statements, unless they are easily demonstrable by facts, be thought of as opinions prompted by experience, but which may extend too far, or may seek to apply to some case principles not applicable thereto, or in short, be in error. In every such case he regretted being unable to revise with language more reserved. The discussion of the first portion of the paper is merely the outcome of a desire to do what he may toward some reconciliation between the work of Morin and that of the more recent investigators. The work of Morin seems too extensive to be ruthlessly thrown aside as it has been by many, especially engineers. For, on the other hand, physicists and mechanicians largely adhere to Morin's results. Such a strife produces in the mind of the average engineering student an unentiable but inevitable opinion regarding present-day knowledge of friction. None of the measurements taken in the investigation should be regarded as absolute. Similarities and dissimilarities among the curves were especially looked for, but only ordinary precautions were taken to promote that constancy essential to standardization for absolute results. Again, only the nature of the stationary rubbing member has been taken up, the moving member having been the same for all tests, and as nearly constant in condition as has been ordinarily possible. This journal was probably not widely different from the average practical shaft journal. Nevertheless much experiment will still be necessary before the results, even if standardized, can be applied to computations.

The Modern Theory of Friction.

Sanford A. Moss, of Lynn, Mass., did not think Prof. Price correctly stated the modern belief regarding frictional behavior. "The best statement of what seems to me to be the modern belief is given by H. F. Moore in a thesis presented to Sibley College. Mr. Moore gives three kinds of friction: Friction of oily solid on oily solid. Mr. Moore calls this 'solid friction.' Morin's experiments probably cover this kind. Friction in which there is a complete film of oil between two solids. Then the solids are nowhere in contact with each other so that their character has nothing to do with the matter, but all the action depends on the oil. This is called 'perfect film friction,' and is a matter of hydrodynamics and not of metallurgy. Professor Osborne Reynolds has treated this matter extensively. To quote Mr. Moore 'a stage intermediate between the two above classes, in which there is not a perfect film separating journal and bearing, and yet in which the friction is not so great and does not follow the same laws as in case one.' Mr. Moore calls this 'intermediate friction.' All of Mr. Price's work falls in the third class mentioned above, 'intermediate friction.' In intermediate friction the matter is to a great extent dependent on the way oil is supplied, as may be readily imagined. It is probably for this reason that there have been such discordant results obtained by various experimenters, and that Mr. Price does not come to any definite conclusion. Using the figures Mr. Price gives, I find he has had a bearing pressure of about 250 lb. per sq. in., and an initial rub-

bing velocity of about 200 ft. per minute. These conditions are rather extreme in bearing practice, and if they existed in an actual bearing would call for very considerable care in lubrication. The bearing pressure is far greater than that which would permit of perfect film lubrication. As Mr. Price states, his lubrication was far from satisfactory, and this probably accounts for many variations. In the region in which Mr. Price was working the composition of the metals is only one factor, the character of the lubrication being another very important consideration. Consistent data for the case of intermediate friction can only be obtained when there is complete flooding of the bearing with oil, so that the bearing surfaces have as much oil as possible between them at all times."

Educational Enterprise in the West.

Prof. Price being at the University of Nebraska led the president to comment with approval upon the work done by western institutions of learning. Remarkable work was being done in the western universities. Work was being done that could not be other than of great benefit to the country. He had been at Brown University quite recently and had met there a very prominent physicist and the latter had mentioned the general doubt in the East regarding the prospect for a satisfactory meeting of scientists in the West. Much to their gratification the meeting in question had turned out to be one of the best they had ever held and the character of the papers presented had been surprisingly high. F. W. Taylor was pleased to hear the views of the president on the status of the work accomplished at western colleges. The present investigation of Prof. Price was so thorough and painstaking that it deserved favorable comment. H. H. Suplee told of the high speed railroad at Berlin. This had given rise to the same experiments on journal friction and these had been considered by the late Prof. Thurston just prior to his death with a view to their incorporation in his book on mill work and lubrication. President Freeman was reminded of his association with Mr. Mills in experimental work some twenty years ago. They had found the necessity of getting metal to metal contact and not have the surfaces separated by a film of oil. A man familiar with lithographic work or working on transfer paper was aware of the difficulty of keeping the surfaces perfectly clean. A touch of the hand was sufficient to make a very material change. In the old experiments it was found that the passing of the hand over machined surfaces made considerable difference. The speaker thought that many of the old figures found in the textbooks were misleading on this account. He ventured to suggest these observations for the consideration of other experimenters.

The Characteristics of Cast Iron.

A paper on "Cast Iron: Crushing Loads and Microstructure," was presented by the author, W. J. Keep, of Detroit. The object of the paper was to make more complete the series of tests on cast iron already recorded in the transactions of the society. The crushing and tensile tests were made by H. Diederichs, assistant professor of experimental engineering, Sibley College, Cornell University. The report on microstructure is by Albert Sauveur, assistant professor of metallurgy, Harvard University, and proprietor of the Boston Testing Laboratories. The photomicrographs accompanying his report were taken and specimens etched in the metallographical laboratory of Harvard University by H. M. Boylston. The specimens for all tests were prepared by Mr. Keep. The paper has numerous tables and is profusely illustrated. In the course of his report, Prof. Sauveur says: "It should be borne in mind that the specimens of cast iron which were subjected to a microscopical examination were neither those which were analyzed nor those that were subjected to the physical tests. It is not to be expected therefore that the photomicrographs which we here reproduce correspond to the structure of the bars actually tested, neither do they suggest accurately the chemical composition of these bars. To try to infer the physical or chemical characteristics of samples of cast iron from the structure of *other samples*, although cast at the same time and under the same conditions, would be a very hazardous proposition, and that is why it is not attempted in this report." Mr. Keep said he was surprised at Prof. Sauveur's comment. He and many others were under the impression that samples were alike if castings were made from the one ladle under the same general conditions. According to the criticism different parts of the same structure so cast might be essentially different. There was no further discussion of the paper.

The Prevention of Smoke.

Prof. Benjamin, of Cleveland, then presented his paper on smoke abatement, which was given very fully in *The Iron Trade Review* of last week. The professor commented upon paragraphs 21-25 of his paper touching upon the legal side of the question and the possibility of smoke suppression by process of law. Judge Kohlsaat of Chicago, had announced recently that the question of expense had nothing to do with the case. The cost of putting in an equipment for smoke prevention gave no one the right to continue a nuisance. If it cost the sum of $25,000 that was not a sufficient objection. John T. Hawkins, of Boston, did not find sufficient data in the paper regarding fuel saved by the introduction of mechanical stokers. He had conducted in 1880 a series of experiments in conjunction with the late Pheron Skeel to determine the possibility of burning bituminous coal of the various grades in a boiler furnace practically without producing smoke, and secondly what was the actual loss due to the production of smoke only other conditions being equal. This boiler setting permitted of very gradual and practically continuous firing by hand; with equally good means of regulating the air supply. It was found practicable to continuously burn either of the brands of bituminous coals to be had at the time absolutely without smoke. It was also found possible, by varying the method of firing and the air supply, to produce at will any degree of smokiness desired at the top of the chimney. One of the objects being to determine the value of unconsumed or uncombined carbon constituting the smoke proper, the results from the two methods of firing—smoky and smokeless—were carefully compared; and it was found that as between the most smoky and absolutely smokeless firing the loss never exceeded 0.7 of one percent. "Most of us older engineers will remember when traveling years ago at night on Hudson river steamers, burning anthracite coal in their furnaces, the more or less entertaining sight of a voluminous and continuous blue flame at the tops of the chimneys, which we, now at least, know came from the incomplete combustion in the furnaces, allowing large volumes of CO to take up at this point the additional atom of O necessary to perfect the combustion, and establishing a secondary furnace, as it were, at the chimney top, while all this should have been accomplished below. Doubtless in furnaces burning bituminous coal similar conditions may obtain, regardless of smoke, which alone never reaches a loss of one percent of the fuel. I am quite at one with Prof. Benjamin otherwise, generally, except that the mere abatement of smoke can be any material source of profit to the owner of the plant, however profitable it may be to the community. If it were true that the mere abatement of smoke could result in any such saving as one-fifth of the fuel, believe me, there would be no such smoky cities as Pittsburg is today. There is no doubt, however, but that any contrivance or system which shall effect a perfect

combustion of bituminous coal, or produce the most economical results, must at the same time effect the abatement of smoke; nor is there any question that mechanical stokers are now among the best means to that end; and certainly no one can at this late day fail to be convinced that for such large plants as admit of the application of mechanical stokers, a smoky chimney has no excuse. If the Vienna engineers could so effectively avoid smoky furnaces as is described by G. C. Henning (*Transactions*, Vol. 24, p. 323), we American engineers should not balk at such a problem. Aside, however, from such extensive plants as permit of or warrant the use of mechanical stokers, there are a thousand and one smaller plants of an infinite variety, down to the heating apparatus of private houses, which offer an inviting field for the inventor in some contrivance, arrangement or attachment which shall insure smokeless furnaces under the kind of management which is necessarily inseparable from such cases. For as Professor Benjamin well says: 'Just as anthracite coal becomes more scarce and its price increases, just so surely will its place be taken by the cheaper and more abundant fuel.'"

A Solution to the Smoke Problem.

A. Bement, of Chicago, thought that the paper, like many others, treats the problem in a general manner and fails to offer a definite solution for any particular case or condition. Every one of the schemes mentioned or recommended is in some cases producing smoke and doing so with the best obtainable manipulation. It is necessary to realize the fact that broadly speaking there are no smokeless furnaces or stokers manufactured for sale. A well intending purchaser may buy the best available apparatus which with a certain superior grade of coal and careful manipulation may produce a smokeless condition, but he may not be able to afford the cost of such superior fuel, or to command the required careful manipulation. Mr. Bement assumed a definite case for solution and took that of the water tube boiler with horizontal inclined tubes. This type was selected for two reasons; first, it is one which by all means, of itself, causes the largest smoke production; and second, it offers the best opportunity for application of smokeless apparatus in series with it. If a thorough mixture of combustible and air could be effected at the grate or in the fuel bed, or if it could be attained a few inches above the fuel bed, then the desired result would be immediately secured, but as such ideal performance is unattainable, and if it was, must be largely disturbed when ashes are removed, something other than a plain grate should be used. This leads to the consideration of a stoker machine which, if fulfilling requirements, must perform two functions; first, continuous and uniform supply of fuel and consequent evolution of combustible, as well as similar removal of ash. Second, to effect a complete mixture of gases at the fire. It is apparent that this first requirement is unattainable with any form of sloping grate or underfeed device, or, in fact, with any stationary or semi-stationary form of grate; therefore, it is not necessary to determine whether these devices will fulfill the second function, that of complete mixture at the fire, especially so, because this may be determined with the next form of stoker to be examined, which is the chain grate, an apparatus which fulfills the first requirement in an ideal manner, but which, like all general forms of stokers, receives its fuel at one end of the grate, at which point evolution of the coal gas occurs in a narrow zone, and that the fulfillment of the second requirement, that of mixture of the gases, does not occur, may be readily observed at the chimney top. Thus, following the stoker throughout its various forms to its most perfect type, that of the chain grate, we find it finally to be a failure as far as complete solution is concerned, because it does not cause sufficient mixture of gases with the air which is present. This final and important requirement which the stoker fails to fulfill, that of effecting mixture of the gases, may be secured by locating a furnace between the stoker and boiler of such capacity that there will be opportunity for mixture to occur before the boiler surface is reached. Such furnace may be easily produced by covering the tubes of the bottom row of the boiler with a refractory tile, which extends from the front to about five feet from the back end of the boiler. The presence of this tile furnace roof requires, of course, that the gases enter among the tubes at the back of the boiler. These conclusions lead to an apparatus which is smoke proof if the furnace is that of a length of from sixteen to eighteen feet, measuring from the point of entrance of the fuel to the exit, and this is the only form of apparatus which produces smokeless combustion of itself independent of its manipulation. Mr. Bement was of course aware that chain grates served with expensive washed coal or specially sized coal, or operated with a very thin fire, often produce but very little smoke, but the combination he described would produce a smokeless result when using the fuel that the stoker is usually sold to burn, and does so with that thickness of fire which gives the best economic result in steam made per unit of fuel, and which at the same time also makes the most smoke *at the fire*. The first example of this combination was produced some years ago by the Chicago Edison Co., by locating this form of furnace between water tube boilers and chain grate stokers, which were already at the time in service, with the result that the Heine Safety Boiler Co. adopted this form of tile for its boilers and the practice of attaching this element to a furnace has been extended to other similar boilers by some different makers. A purchaser therefore may buy a boiler and its furnace element from one maker and a chair grate stoker from another and in this way obtain a smokeless apparatus. "I think that Professor Benjamin overrates the lack of proper public sentiment favoring smoke prevention. There are many people who are doing as well as they can with the imperfect apparatus at their disposal, many of whom have displaced one form for another without deriving benefit thereby. Also others who have purchased the best that the market afforded, and which make serious smoke, and they cannot stop it. As a matter of fact, it is the practice of the engineers who design and select the apparatus that is not keeping up to the pace set by owners and their operatives. An inference in the paper should be corrected, which is, that owing to the small opening in the chain grate, a strong draft is necessary. Now, a chain grate stoker cannot operate with a very strong suction draft on account of excessive air leakage through the coal hopper, and the usual limit is about 0.6 in. of water, and with such draft, coal containing about ten percent of ash and a like amount of moisture, has burned at the rate of 60 lb. per sq. ft. of grate per hour. Such coal was necessarily of a very favorable size, but this shows how much air can flow through these small openings, especially as it was as much as 100 percent in excess. I have found that the amount of opening through different grates has but little effect on the amount of the coal burned as far as air is concerned, but that the condition of the fuel bed has an enormous influence. Another matter that should be mentioned, is that chain grate fires may be made to respond to demands of regular and irregular peaks of load as found in electric generating stations, if the operation of the fires and stokers is properly managed."

The Conditions of Smoke Prevention.

George H. Barrus, of Boston, pointed out that the cost of the stoker is often one-half that of the boiler itself and manufacturers object to this addition. A. J. Herschmann,

of New York, had found that 450 h. p. could be managed by one fireman with either hard or soft coal. Ambrose Swasey as one of the "guilty manufacturers of Cleveland had done something to eclipse the sun in that city." He could speak warmly of the work accomplished by Prof. Benjamin. He had found it beneficial to give the engineer to understand that his position depended upon the condition at the top of the smoke stack. He thought that careful hand firing could approximate the work of the mechanical stoker. Max H. Miner, of New York, in commenting upon the task of firing a locomotive said that 150 shovelfuls were thrown into the furnace to the half hour in a case cited. There seemed to be an opportunity for the mechanical stoker which would permit the handling of fuel on the locomotive with little opening of the door. Some general discussion followed in reference to the possible saving with the use of the stoker. Several members had found rather disappointing results but all agreed that where the labor cost was high the stoker was advisable. One speaker knew that the boilers at the postoffice in New York were run on poor fuel but gave forth no smoke and he would like to know something of their equipment. Two other members with offices in the neighborhood were equally certain that the boilers in question not only sent out a good allowance of smoke but distributed a generous supply of ashes in the vicinity. This discrepancy in expert testimony was promptly discounted by an agreement that a great deal depended on the location of the observer's office. Mr. Freeman said it devolved upon the members to carry on a campaign of education. He was one of the visitors to England with the 89'ers and there learned that in one of the cities an observer was stationed in a tower and on a first offense he called up the offender and on a second offense he *called* him some more. He understood that at places here where the regulations were somewhat strict the burning of inferior fuel was done after dark. In a city like some in this country, that observer would need a searchlight and keep it at work during the night. Prof. Benjamin did not see any economy in mechanical stokers with high priced fuel. In answer to a question about the improvement of coal as you go East said that he did know that coal became worse as you go West. He gave some of his experience with various manufacturers and if all were of the type of Mr. Swasey the position of smoke inspector would be a sinecure. He acknowledged the coöperation of the trunk roads entering Cleveland, it was extremely cordial.

WEDNESDAY EVENING SESSION.

The paper by A. S. Mann, of Schenectady, N. Y., "Can a Steam Turbine be Started in an Emergency Quicker than a Reciprocating Engine of the Same Power," is given in this issue of *The Iron Trade Review* and it will be seen that the answer is very much in the affirmative. R. H. Rice, of Lynn, Mass., said the facts given in the paper were evidence of the rough treatment to which turbines can be subjected. There was no reason why the turbine could not be run in this manner indefinitely. In fact it was customary in the shop to start turbines this way. Secretary Hutton was prompted to inquire about the starting of the engines of the vesels moored to the North German Lloyd pier at the time of the fire. Some of these were started hurriedly and a vessel taken to safer quarters in good season. President Freeman had heard of a similar case in Chicago but in that case the boat did not get away from the pier in time. It was a Government vessel and the officer in charge explained the situation by saying that in such cases it was necessary to advertise for bids. H. H. Suplee intimated that the boat mentioned by Prof. Hutton was the Kaiser Wilhelm der Grosse. He expected to get some further information and would present this for the *Transactions* of the society.

The secretary gave an abstract of the "Note on Efficiency of Steam Generating Apparatus," by A. Bement, of Chicago. This appeared in *The Iron Trade Review* last week. It was discussed by A. A. Cary, of New York, with due consideration of the combined and separate efficiencies of boiler and furnace. This was practically a continuation of the argument presented by Mr. Cary at the last meeting of the society in answer to Mr. Bement's previous paper. Prof. Wm. Kent, of Syracuse, N. Y., asked the privilege of contributing some discussion to the *Transactions* which he would prepare later. In further comment upon furnace considerations he was reminded of the familiar "before and after" principle. He had made some tests with Prof. Carpenter many years ago on a contrivance to improve boiler efficiencies. The test showed that there was a gain of 22 percent but that gain was ridiculous. It had nothing to do with the special device applied to the boiler and really meant that other changes then made had greatly altered the general conditions from very bad to good. He was of opinion that boiler economy had not improved and did not believe that the Galloway record at the Centennial Exposition had been surpassed.

Mr. Bement's second paper "Performance of a Superheater" will be printed in *The Iron Trade Review.*

Steam Driven Valves.

A description of a steam actuated valve gear by W. H. Collier, of Jackson, Tenn., related to a 14 x 30 engine running 100 revolutions per minute, developing from 80 to 120 h. p. This has been in operation ten hours per day for the past six months in the power plant of the Southern Engine & Boiler Works. Aside from simplicity of construction and increased economy due to high rotative speed and minimum clearance, the following advantages are claimed: Perfect distribution of steam, all movements of valves are full and instantaneous, cut-off varying under control of governor from no load to full stroke, and variable compression. Closer regulation as governor has absolutely no work to perform, but merely indicates point of cut-off. No safety device is necessary, as the speed limit is governed by velocity of steam through admission port of governing valve, which makes it absolutely impossible for speed of engine to increase 50 percent above that for which it is designed. A higher rotative speed of engine, speed of engine being limited by piston speed only. Engine is reversible, may be made to run in either direction, started or stopped by means of sliding key. A valve gear in which it is impossible to get valves out of adjustment. A more economical valve gear, doing away with friction and weight of releasing gear, dash pots, rocker arms, eccentrics, etc., steam on actuating pistons being used expansively.

F. M. Rites, of Ithaca, N. Y., found the description of this new mechanism very interesting, as the writer of the paper seems to have positively simplified the tripping mechanism of the Corliss engine, while actually increasing the efficiency of the combination. It seems certain from the simple character of the mechanism that the available speed should be considerably higher than the usual releasing gear. Generally speaking, it would seem a distinct advance in the art of engine design.

H. H. Suplee inquired if any of the members were familiar with the design of the Babcock & Wilcox engine. This had steam actuated valves. Prof. W. Kent said this engine was exhibited at the Americ.n Institute Fair of 1871. A member was of the opinion that the reason steam actuated valves had not come into general use was their tendency to leakage, a fault that was probable with the engine now described.

THURSDAY MORNING SESSION.

The first paper on the programme was entitled, "Note on Heads of Machine Screws," by H. G. Reist, of Sche-

nectady, N. Y. This is in the present issue of *The Iron Trade Review*. L. D. Burlingame, of Providence, R. I., gave a description of another style of machine screw head with flat top and rounded corners. This seemed preferable to those exhibited in either Fig. 1 or 2 of the paper. It was not illustrated in the paper but would take the place of two of the styles shown. This screw head had been worked out at the Brown & Sharpe Mfg. Co.'s works and the formula for the head was 1¼ times the diameter of the screw plus 1-16 in. The formula given in the paper would seem to make the heads too large in proportion to the threaded portion in the case of the larger sizes. He thought there might be some room for a standard for thickness of head also.

The Creeping of Belts.

"Belt Creep," a paper by Wm. W. Bird, of Worcester, Mass., followed and is an attempt to determine the amount of slip in belts and the allowance that should be made for it. The author finds that the minimum amount of slip in a belt transmitting power from one pulley to another is a question of creep for it is possible to have belts large enough so that with proper tensions there will be no regular slip. With a difference in tension on the two sides and elasticity in the belt, creep is bound to take place. He exhibited a model for showing creep in belts and his paper has several tables and diagrams detailing experiments made in the testing laboratory of the Worcester Polytechnic Institute. He says in conclusion, that the creep for the common leather belt running under ordinary conditions should not exceed one percent. While this is sometimes called legitimate slip, it is an actual loss of power and can not be avoided by belt tighteners or patent pulley coverings. George H. Barrus, of Boston, Mass., desired further information on the question, particularly the behavior of the belt when the pulleys were of different sizes. Did the term diameter as used by the author mean the diameter of the pulley rim or the diameter taken at some point in the thickness of the belt? He also wished to learn whether experiments had been made on pulleys of different sizes. In the absence of the author, answers to these questions, propounded by letter, were not forthcoming. There was no further discussion.

"The Function of Laboratory Courses in the Curriculum of Engineering Schools," by Charles E. Lucke, of New York, found much favor and received lengthy discussion by Hugo Diemer, of Indianapolis, A. Bement, of Chicago, and others. It is largely a consideration of the course of instruction used at Columbia University, where the author has charge of the experimental laboratory. It is in brief, as Secretary Hutton irreverently said, "An attempt to get away from the cook book method." Arthur L. Williston, of the Pratt Institute, Brooklyn, commended the paper highly. Prof. Jacobus, of the Stevens Institute, Hoboken, N. J., gave a description of his methods and the change in practice. He was in favor of developing the student's powers of initiative and believed in system but not too much of it. H. H. Suplee had met Prof. Unwin two years ago and that authority had expressed the belief that systematizing and codifying were carried too far with students. Mr. Suplee called attention to the magnificent engineering schools on the continent. There the professors used their laboratories for research work and this original work could be carried on to the advantage of of the students and the college and would add to the fame of the university itself. He particularly mentioned the laboratory work of Prof. Stodola and the school equipment at Charlottenburg and Munich.

A paper by E. N. Trump, of Syracuse, N. Y., on "Continuous Measuring and Mixing of Powdered Materials in Accurate Proportions," was read but not discussed.

Rear Admiral Melville, of Philadelphia, had a paper on "Epochs in Marine Engineering." This had been presented at one of the monthly meetings in New York. It received some discussion by John T. Hawkins, of Boston, and A. Bement, of Chicago. These will be given at some length later.

The Abatement of Vibration.

"Counterweights for Large Engines," by Prof. D. S. Jacobus, of Hoboken, N. J., had been postponed from the program of the evening previous at the request of the author. It is given in the present issue of *The Iron Trade Review*. Fred N. Bushnell, who was associated with Prof. Jacobus in the work described in the latter's paper, submitted the following:

"The methods described in this paper for lessening the vibration of the engines are of great interest and value to engineers who have to do with the installation of machinery where the nature of the soil is such that it is impossible to get absolutely rigid foundations within commercial limits of cost. The conditions in Providence are such as exist in many other cities where large areas of land along the water fronts have been made by filling in with gravel, cinders and miscellaneous refuse, and a more extended description of the underlying earth strata and the character of the sub-structure in this case may be of interest.

"The Manchester Street power station is situated upon the westerly side of the Providence river, with its easterly end about fifty feet from the harbor line. Originally this site was covered with water, but some years ago it was filled in to about elevation 5 above mean high water. Before preparing the plans for the foundations, a number of borings were made within the area to be occupied, and the nature and average depth of the earth strata were ascertained to be as follows: Sand, gravel and cinders (filling), 13 ft.; silt, 28 ft.; sand, gravel and a little clay, 4 ft.; very fine sand and a little clay, 25 ft. Underlying all of the above was a deep bed of clay, sand and gravel.

Features of the Foundation.

"The conditions revealed by these borings indicated that it would not be advisable to carry the foundations down to the solid sub-stratum on account of the cost, and it was therefore decided to build a pile and concrete sub-structure of ample strength for the loads to be imposed, and to provide as far as possible against vibration by enclosing it within a heavy sheet-piling cofferdam which would present a large bearing surface to the surrounding earth. While it was hoped that this form of construction would prevent objectionable movement of the building, it was realized that the resisting power of the earth could not be determined with absolute certainty, and in deciding upon the plans, the possibility of having to take some measures later on to lessen the horizontal shaking forces in the engines received proper consideration. The sheet-piling cofferdam was made of 6-in. Georgia pine, driven to a depth of forty feet below mean high water. It enclosed the entire area of the building, approximately 33,500 sq. ft. This cofferdam, in addition to providing against vibration of the building, was also intended to exclude all water from the enclosure during the progress of the work. Within this area 5,475 spruce and chestnut piles were driven, space 30 in. from center to center, excepting under the steel columns and the chimney, where they were spaced on 24-in. centers. The longest of these piles was driven to a depth of 63 ft. below mean high water, and their average length was 51 ft. No pile was allowed to be driven which was less than six inches in diameter at the tip. The pile cut-off under the chimney was at elevation-7, and under the rest of the building at elevation -2. The earth was excavated to a depth of about one foot below the pile cut-off, and a bed of Portland cement concrete was laid around and on top of the piles to elevation 2, covering the entire area enclosed by the sheet-piling cofferdam. This work constitutes the substructure supporting the building walls, chimney, foundations for engines, boilers, etc. The pressure of the earth on the outside surfaces of the sheet-piling cofferdam, however, did not prove to be quite sufficient to hold the structure against the shaking forces in the engines, and it was decided to investi-

gate the nature of these forces and to apply such remedies as were necessary. Professor Jacobus' paper fully describes the ingenious instrument which he devised to accurately measure the vibrations, and also the methods employed to determine the proper counterweights to apply to the disc-cranks and flywheels to correct it. In practice the results obtained from the application of these counter-weights have been all that could be desired. We were a little afraid that the heavy counterweights on the revolving fields of the A.C. generators might cause some trouble in synchronizing these machines, but we find that this is not the case, as they couple together easily with the counterweights in any relative position. While there is a somewhat greater interchange of current between these machines with the counterweights quartering or opposed than when in exact step, as was to be expected, this is not sufficient to cause the generators to get out of step or to produce any perceptible influence on the line.

"Notwithstanding the large size of these horizontal engines and their high rotative speeds, since the application of the counterweights they have run very smoothly and with no more attention than is usually required by slower running machines. The present movement of the building (.004 in.) with the counterweights of all three horizontal engines running together is scarcely noticeable

"It is interesting to observe in connection with this subject that the cost of applying the counterweights was only about two and one-half percent of the estimated cost of carrying the foundations to hard bottom."

F. M. Rites, of Ithaca, N. Y., also presented some comments as follows:

"One of the most serious and intricate problems requiring the services of the expert engineer is that of vibratory forces. These forces are so varied and of such common occurrence, while their results are so difficult to predict in advance, that it is impossible to provide for them or to formulate any law which shall cover them. In my opinion, the writer of this paper is to be congratulated on solving the problem he has outlined with so little experiment, since it is sometimes almost impossible to even trace the cause of such a difficulty. The success attendant on the changes described indicate the correctness of the diagnosis of the case, which might have required a long continued course of experiment to determine the root of the difficulty.

"I remember being called in consultation on a somewhat similar case at Wheeling, W. Va., where one particular engine always caused vibrations of doors and windows over a block away from the power house, while in one case a high, close, board fence perceptibly vibrated. No other engine made any such an effect, and any other engine running with this one caused a cessation of the vibration. In this case the vibration was transmitted through the air, and all that was needed was a muffler on the exhaust. An exactly similar case occurred at Allegheny, Pa., and in neither case was the exhaust powerful enough to be objectionable to the neighborhood, except in the matter of vibration.

The Oscillation of the Sky Scraper.

"We are all aware of the occasional vibration of office buildings by steam plants, so that most builders carefully carry piping from the foundation, with as little contact with the walls as possible. In one case of this nature a very disagreeable vibration was felt on one floor midway of the rest and none whatever at the other floors.

"The paper is exceedingly interesting, both in its description of causes and the cure of the trouble, but it seems to me the counterweight should have included in its balance the entire weight of all the reciprocating parts, since the entire horizontal component of the disturbing forces was to be balanced, and this would call for an even larger weight."

George H. Barrus, of Boston, Mass., congratulated the professor on his courage in applying these heavy counterweights for use at such speeds. The author had done much good in frankly setting forth his work and these accounts of experience were great benefit to engineers engaged in similar practice. In reply, Prof. Jacobus acknowledged the enterprise of Mr. Bushnell in carrying out his suggestions. Mr. Bushnell designed the counterweights and applied them. Regarding the heating of the engine journals, about which some inquiry had been made, he had found them of ample size and had had no trouble. In making this change of the engines he had simply brought about an alteration from the horizontal components to those found in vertical engines, the forces tending to translation of the machine had been brought into vertical action. It had not been convenient to fully counterbalance the engines as there were electrical conditions to be met and the result was a practical compromise. Prof. Hutton gave with much humor an interesting account of an investigation made in conjunction with Prof. Denton. This was in reference to the vibration occasioned by a logwood chopping machine in New York. He had found that considerable vibration was conducted by the air and that a high board fence or similar obstacles were sufficient to lessen the annoyance. The tall office building had brought to light a number of peculiarities akin to those of a violin. The third, fifth and ninth stories, for example, are all right and the second, fourth and eighth are all wrong for comfort. In answer to Mr. Oberlin Smith, of Bridgeton, N. J., the professor said the trick with the steam turbine was to run with the door of the engine room equipped with weather strips.

Fulton Celebration.

There will be a centennial celebration of Robert Fulton's famous exploit on the Hudson River, to be held in New York in 1907, and it was decided to participate in the anniversary.

Newell Sanders, of Chattanooga, Tenn., took occasion to remind the members that 1915 would be the semi-centennial anniversary of the close of the Civil War. The Government will erect a memorial arch that will doubtless rival the arch of triumph at Paris and Chattanooga will hold a Peace Exposition. The Exposition at St. Louis followed the Exposition at Chicago by eleven years and that interval would elapse before the Exposition of his city came into being.

The proceedings then terminated and the convention adjourned.

Excursions and Receptions.

These were numerous and included visits to the plant of the McClave-Brooks Co., makers of stokers, grates and steam blowers, and the Pine Brook breaker, which has a capacity of 2,000 tons prepared coal per day. The depth of the shaft is 300 ft and the distance from the surface to the top of the hoisting tower is 190 ft. There are four electric locomotives in the mine and two more will be added shortly. About 1,000 men are employed in the mine and breaker. The International Correspondence Schools, which employs in Scranton 1,200 people and has with field force some 3,000 employes, offers 200 courses, covering all branches of engineering. It has enrolled nearly 800,000 students. The printery is one of the largest in the United States and is equipped with electrically driven and automatically operated machinery, including electrically controlled automatic presses; a Harris press, printing 100 envelopes a minute; the Monotype machine which sets and casts 4,500 letters an hour, and many other special machines. The Allis-Chalmers' plant in Scranton builds blowing engines, hoisting engines, Corliss engines for mill and electric generating purposes, mining machinery and sugar machinery. A portion of this shop is equipped with direct connected electrically driven machine tools, and the remainder of the equipment is driven by means of line shafts from motors. It forms an interesting comparison between the two systems. The erecting shop was constructed especially for the purpose of erecting large engines, and a steeple compound blowing engine for the Lackawanna Steel Co., having steam cylinders 46 x 86 x 60 in., and air cylinders 84 x 84 x

60 in. was seen in course of erection. About 600 men are employed.

On Thursday a special train furnished by the Delaware, Lackawanna and Western Railroad left for the new car shops, Hampton central boiler plant, power plant and water hoist of the Lackawanna Co., and on Friday another special train left for brief inspection of the Laurel Line power house and thence to Wilkes-Barre Here was the Vulcan Iron Works, making hoisting engines, light locomotives and a general line of mining machinery; the No. 5 colliery of the Lehigh & Wilkes-Barre Coal Co.; the Hazard Mfg. Co., maker of cable and rope for haulage as well as electrical purposes; and the Sheldon Axle Works, manufacturing springs and axles for vehicles.

There was a reception to the ladies of the party by Mrs. J. Benjamin Dimmick, and pleasant drives during the week to Lake Scranton and other points of note were provided by way of special cars and automobiles.

Thursday evening the local members of the American Society of Mechanical Engineers, together with the Scranton Engineers' Club, the board of trade and the citizens of Scranton, tendered a reception to the officers, members and ladies of the society, at the Scranton Bicycle Club. This function was also of most gratifying character.

Members in Attendance.

John R. Freeman, president A. S. M. E., Providence, R. I.
Frederick R. Hutton, secretary A. S. M. E., New York.
Francis W. Hoadley, cashier A. S. M. E., New York.
Louis A. Gillet, assistant to secretary A. S. M. E., New York.
Wm. F. Mattes, Cons. Eng., Scranton, Pa.
Rufus J. Foster, vice president International Text Book Co., Scranton, Pa.
A. B. Clemens, Intern'l Corres. Schools, Scranton, Pa.
I. McC. Bean, Engr. and Contractor, Scranton, Pa.
Douglas Bunting, Chief Engr. Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre, Pa.
Nelson Crawford Durand, Asst. Mgr. International Text Book Co., Scranton, Pa.
Orla K. Harlan, Asst. M. E. Del., Lack. & West. Ry., Scranton, Pa.
John J. Harris, M. E., Board of Education, Scranton, Pa.
Edwin H. Jones, Pres. and Gen'l Mgr. Vulcan Iron Works, Wilkes-Barre, Pa.
Samuel T. Nicholson, Sec'y Vulcan Iron Works, Wilkes-Barre, Pa.
Robert V. Norris, Cons. Engr., Wilkes-Barre, Pa.
Emery Hulbert Powell, M. E., Intern'l Corres. School, Scranton, Pa.
Vernon H. Rood, V. P. and Mgr. Jeanesville Iron Works Co., Hazelton, Pa.
Chas. Andrew Straw, M. E., Lehigh Valley Coal Co., Wilkes-Barre, Pa.
Samuel D. Warriner, Gen'l Mgr. Lehigh Valley Coal Co., Wilkes-Barre, Pa.
Henry Webber, M. E., Finch Mfg. Co., Scranton, Pa.
C. A. Delaney, Scranton, Pa.
A. B. Dunning, chairman, Scranton, Pa.
J. W. Fowler, Scranton, Pa.
F. W. Gerecke, Scranton, Pa.
G. T. Gwilliam, Scranton, Pa.
H. E. Gilpin, Scranton, Pa.
H. R. Gough, Scranton, Pa.
F. B. Hamilton, Scranton, Pa.
N. H. Hiller, V. P. and Treas. Carbondale Machine Co., Carbondale, Pa.
W. W. Inglis, Scranton, Pa.
Henry Jifkins, Scranton, Pa.
J. D. Jones, Scranton, Pa.
A. C. LaMonte, Scranton, Pa.
A. E. Lister, Scranton, Pa.
William Lloyd, Scranton, Pa.
William McClave, Scranton, Pa.
R. F. McKenna, Scranton, Pa.
W. M. Marple, Scranton, Pa.
R. H. Nicholson, Scranton, Pa.
Charles C. Rose, Scranton, Pa.
J. G. Sanderson, Scranton, Pa.
Worthington Scranton, Scranton, Pa.
Charles Seamans, Scranton, Pa.
James G. Shepard, Scranton, Pa.
E. M. Stack, Scranton, Pa.
H. H. Stock, Scranton, Pa., chairman.
George T. Thomas, Scranton, Pa.
A. P. Trautwein, Pres. Carbondale Machine Co., Carbondale, Pa.
R. B. Vaughn, Scranton, Pa.
H. M. Warren, Scranton, Pa.
E. M. Zehnder, Scranton, Pa.
J. W. Paul, Supt. Pittsburgh Writing Machine Co., Kittanning, Pa.
W. W. Nichols, Diamond Drill & Mach. Co., Birdsboro, Pa.
C. H. Benjamin, Cleveland.
Robert S. Brown, Sec'y New Britain Mach. Co., New Britain, Conn.
H. L. Aldrich, *Marine Engineering*, New York.
Charles D. Montague, Cold Spring, N. Y.
John M. B. Scheele, 126 Liberty street, New York.
L. S. Louer, Western Mgr. *Engineering Record*, Chicago.
Fred Nolde, Sales Mgr., Power Dept., Philadelphia District, Allis-Chalmers Co., Philadelphia.
George A. Bulinger, Dayton, O.
Thomas A. Wright, Wilkes-Barre, Pa.
C. E. Tobey, Scranton, Pa.
Robert I. Clegg, *The Iron Trade Review*, Cleveland.
Thomas Hill, Supt. Quincy Eng. Works, Quincy, Ill.
Allen Stirling, Scranton, Pa.
Gregory C. Kelly, Mgr. Wm. Nichols & Co., Germantown, Pa.
Henry S. Hayward Jr., M. E., Franklin, Pa.
Frank B. Kleinhans, Chief Engr. Fisher Foundry & Mach. Co., Pittsburg, Pa.
John C. Parker, Philadelphia.
G. R. Cullingworth, M. E., Garvin Machine Co., Mount Vernon, N. Y.
C. E. Kinne, M. E., The Bagley & Sewall Co., Watertown, N. Y.
L. D. Burlingame, Chief Draftsman, Brown & Sharpe Mfg. Co., Providence, R. I.
Elmer H. Neff, New York representative Brown & Sharpe Mfg. Co., New York.
John M. Sherrerd, Easton, Pa.
Alex. H. Sherrerd, Scranton, Pa.
Richard H. Rice, Cons. Steam Engr., Gen'l Elec. Co., Lynn, Mass.
D. J. Lewis Jr., Cons. Engr., A. A. Griffing Iron Co., South Orange, N. J.
Newell Sanders, Newell Sanders Plow Co., Chattanooga, Tenn.
H. R. Cobleigh, *Iron Age*, New York.
H. H. Suplee, *Engineering Magazine*, New York.
W. E. Mathews, Norwalk Iron Works Co., So. Norwalk, Conn.
A. W. K. Peirce, Cons. Elec. Engr., The Cons. Gold Fields of South Africa, Ltd., Johannesburg, S. Africa.
William T. Donnelly, Cons. Engr., New York.
Benj. G. Buttolph, Providence, R. I.
Edwin D. Pingree, Providence, R. I.
Geo. E. Ames, Mech. Supt. Lawrence Mfg. Co., Lowell, Mass.
Fred J. Miller, *American Machinist*, New York.
Fred W. Taylor, Cons. Engr. Highland Station, Philadelphia.
J. Lawrence Hagy, Elec. Storage Battery Co., Philadelphia.
Chas. N. Trump, Trump Bros. Machy. Co., Wilmington, Del.
Frederic A. Parkhurst, M. E., The Portland Co., Bridgeport, Conn.
L. Alvin Zohe, Solvay Process Co., Syracuse, N. Y.
F. R. Low, *Power*, New York.
John A. Serrell, New York.
H. E. Sibson, M. E., Harrison Safety Boiler Works, Philadelphia.
J. T. Jeter, Wilkes-Barre, Pa.
J. B. Poore, Scranton, Pa.
Robert Allison, Port Carbon, Pa.
Ward S. Jacobs, M. E., The Phoenix Iron Works Corporation, Hartford, Conn.
Henry R. Cooper, Mgr. Caustic Soda Dept., Solvay Process Co., Syracuse, N. Y.
Ambrose Swasey, The Warner & Swasey Co., Cleveland.
Chas. E. Eaton, Carthage, N. Y.
G. Norwood Comly, Engr., Solvay Process Co., Syracuse, N. Y.
J. R. Sayler, Scranton, Pa.
A. S. Mann, M. E., Genl. Elec. Co., Schenectady, N. Y.
C. W. Hunt, New York.
W. T. Sears, Penna. Steel Co., Philadelphia.
W. H. Collier, Supt., Southern Engine & Boiler Works, Jackson, Tenn.
Chas. A. G. Winther, Genl. Supt., Chapman Valve Mfg. Co., Boston.
C. W. Obert, *Street Railway Journal*, Brooklyn, N. Y.
F. H. Ball, American Engine Co., Plainfield, N. J.
William H. Morse, Power & Mining Machinery Co., New York.
William E. Hussey, Mgr., New York Office, Providence Engineering Works, New York.
Paul R. Brooks, New York.
W. J. Keep, Michigan Stove Co., Detroit, Mich.
S. H. Pitkin, Wellman-Seaver-Morgan Co., Akron, O.
P. J. Bryant, Andrew McClean Co., Passaic, N. J.
Max H. Miner, *Railway Age*, New York.
Arthur J. Herschmann, Cons. Engr., New York.
Edward H. Marot, Philips & Townsend, Philadelphia.
Charles Whiting Baker, *Engineering News*, New York.
J. A. Lafore, D'Olier Engineering Co., Philadelphia.
W. M. Allen, Warner & Swasey Co., Cleveland.
S. Balkwill Jr., Cleveland Frog & Crossing Co., Cleveland.
E. R. Gnade, Oil Well Supply Co., Oil City, Pa.
John E. Lord, Allis-Chalmers Co., Brooklyn, N. Y.
H. W. Rowley, Allis-Chalmers Co., Brooklyn, N. Y.
E. H. Foster, Power Specialty Co., New York.
Charles H. Longenecker, Julian Scholl & Co., New York.
Wm. H. McKiever, Wells & Norton Co., New York.
William Hutton Blauvelt, Semet-Solvay Co., Syracuse, N. Y.
Arthur C. Jackson, Miller Lock Co., Oak Lane, Philadelphia.
Stonewall Tompkins, Miller School, Va.
Charles H. Little, Universal Drafting Mach. Co., Cleveland.
B. P. Flint, New York.
C. W. Robinson, New York.
George M. Brill, Cons. Engr., Chicago.
F. H. Stillman, The Watson-Stillman Co., New York.
Oberlin Smith, Ferracute Machine Co., Bridgeton, N. J.
Wm. F. Dodge, Wilkes-Barre, Pa.
Forrest R. Jones, Sibley College, Ithaca, N. Y.
William Kent, Syracuse University, Syracuse, N. Y.
Y. U. Thomson, Scranton, Pa.
C. P. Higgins, Roselle, N. J.
Francis H. Doane, Scranton, Pa.
G. M. Basford, *American Engineer*, New York.
W. L. Cheney, Lucas Machine Tool Co., Cleveland.
William B. Mayo, Coe Brass Mfg. Co., New York.
Henry W. Buckley, New York.
George E. Whitehead, R. I. Tool Co., Providence, R. I.
L. H. Kenney, Wm. Cramp & Sons Ship & Eng. Bldg. Co., Philadelphia.
Charles S. Gladden, J. G. White & Co., New York.
Wm. H. Kenerson, Brown University, Providence, R. I.
W. E. Schoenborn, Washington, D. C.
Samuel D. Collett, Elevator Supply & Repair Co., New York.
David H. Darrin, New York.
Charles H. Corbett, Continental Iron Works, Brooklyn, N. Y.
Arthur J. Frith, Sec'y, Washington Co., New York.
D. S. Jacobus, Steven's Institute, Hoboken, N. J.
E. B. Wilson, C. E. & G. M., Scranton, Pa.
T. W. Holloway, M. E., Scranton, Pa.

What is claimed to be the largest electric pump in the country and the first of its kind and capacity ever built will be in operation within a short time at the Buffalo Water Works Pumping Station. Hydraulic engineers throughout the country are interested in the machine which will pump 25,000,000 gallons of water every 24 hours.

COUNTERWEIGHTS FOR LARGE ENGINES.

BY D. S. JACOBUS, HOBOKEN, N. J.

The writer was called upon to investigate the problem of lessening the vibration of the engines at the new power plant at the Manchester street station of the Rhode Island Co., Providence, R. I., and working conjointly with F. N. Bushnell, the chief engineer of the company, he recommended that certain counterweights be added in addition to those already on the engines. These counterweights, which were exceptionally large, were adopted and gave satisfactory results.

In addition to the problem of lessening the vibration certain electrical problems arose regarding the effect of the counterweights in increasing the variation in angular velocity of alternating current generators run in parallel with each other. A number of measurements were made to determine the action of the counterweights, both as affecting the vibration of the building and the tendency of the alternating current generators to break apart when run in parallel, and as this data may be of interest to the society it is hereby presented.

The counterweights were applied to three engines, all of which were of the same cylinder dimensions and had the same weights of reciprocating parts. The engines were built by the Filer & Stowell Co., of Milwaukee, Wis., and were of the horizontal cross compound type directly connected to electrical generators. Two of the engines, designated as Nos. 1 and 2, were connected to 1,500 kilowatts alternating current generators, and one, designated as No. 3, to a 1,600 kilowatt direct

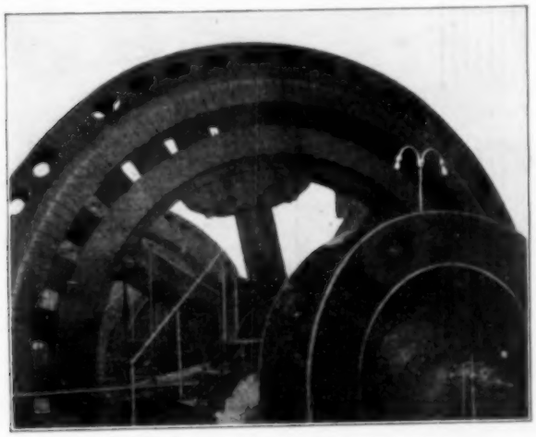


FIG. 1.—REVOLVING FIELD SHOWING COUNTERWEIGHT.

current generator. A photograph of a portion of the revolving field of the No. 2 engine showing one of the counterweights which was placed in the revolving fields is reproduced in Fig 1.

On inspecting the plant it was evident that something should be done to diminish the shaking. The entire building rested on piles which passed through silt for about 30 ft. before striking a solid bottom. There was a mass of concrete about 5 ft. thick placed on these piles which extended under the entire plant so as to form a bend on which rested the foundations of the buildings, boilers and engines. The bed of concrete also extended under the chimney foundation. When the first observations were made the buildings were not completed. All three engines were, however, installed and were protected by a temporary wooden structure. The boiler plant was in the process of construction, much of the brick work having been laid, and the steel framework of the building nearly completed. A portion of the boiler plant was running to supply steam to one of the engines. The chimney, which was ultimately to be about 300 ft. high, was being erected. This was built of special brick furnished by the Alphons Custodis Chimney Construction Co.

The engine which was running was that designated as No. 3, and it shook the entire foundation to such an extent that the motion could be readily felt by a person standing thereon. When water was poured outside of sheet piling, which surrounded the foundation, the surface of the water could be seen to move up and down in time with the strokes of the engine.

After inspecting the plant the writer constructed an apparatus on the principle of the seismograph for measuring the amount of vibration. On a second visit to the plant the horizontal shake of the foundation was measured with this instrument with engine No. 3 running, and found to be 0.01 in. at the engine. This may not seem to be a large amount, but as the entire mass of the building foundation shook, the movement of parts of the temporary wooden building was magnified in many places so as to be very evident to the eye. Furthermore the iron work of the boiler house shook considerably. That the entire mass of the foundation shook could be appreciated by feeling the vibration through the feet and also by measuring the actual amount at different points with the special apparatus. At a point near the extreme end of the foundation where the No. 1 engine was located the foundation was found to shake 0.008 in. Measurements made near the top of the chimney, which was erected to the height of about 175 ft. above the ground, showed that the maximum shake with the engine running at its ordinary speed of 90 revolutions per minute was about 0.02 in. After measuring the vibration of the chimney with the engine running at its ordinary speed the engine was shut down and a marked result took place when its speed fell in harmony with the time of vibration of the chimney. When this occurred, the chimney shook to such an extent that the motion was beyond the range of the special instrument. The total movement of the pointer of the instrument was such that the chimney was shown to move more than ⅛ in. In constructing the chimney the workmen had noticed that when they came to a height of about 130 ft. the vibration was much greater than it was after the chimney was built higher. This made it appear that at a height of 130 ft., at which there was the most shake, the time of the vibration of the chimney was in harmony with the number of revolutions made by the engine.

As the entire plant shook laterally on top of the piles, and as there could be no vertical movement, it appeared evident that the best plan would be to place counterweights on the engines of such sizes that they would diminish the horizontal shaking forces to nearly a minimum irrespective of the vertical shaking forces which might be produced. This would give much larger counterweights than are ordinarily used, but on carefully considering the conditions which existed it was deemed best to adopt them. The counterweights originally on the engines were comparatively small and it was found impossible to place large enough weights on the crank disks to carry out this plan. It was therefore decided to place counterweights on the fly-wheels in addition to placing as heavy counterweights as possible on the crank disks. A counterweight in the fly-wheel acts just as efficiently as one placed on the crank disk in eliminating the shaking forces tending to translate the bed of the engine, but with such a counterweight there remain forces which act as couples and tend to shake the engine by rotating it about its center of mass. The horizontal forces tending to produce translation were, however, the most important in the case under consideration, and these were considered irrespective of the forces tending to produce rotation.

The weight of the counterweights recommended to be added in addition to those already on the No. 3 engine was 4,995 lb. on each of the crank disks and 3,600 lb. in the fly-wheel, the distance of the center of gravity of the weights on the crank disks from the center of the shaft being 2.38 ft. and for the weight in the fly-wheel 7.67 ft. The counterweights originally

*Abstract of paper read at the Scranton meeting (June, 1905,) of the American Society of Mechanical Engineers.

in each crank disk amounted to a net weight of 1,740 lb. at 2.05 ft.

The position of the fly-wheel counterweight and the shaking forces with and without the additional counterweights are shown in Fig. 2

Mr. Bushnell designed counterweights for the No. 3 engine to conform with the above sizes. These counterweights are shown in Figs. 3 and 4. The counterweights finally placed on the engine were somewhat lighter than called for but not enough so to produce any great difference in the results. On starting up the No. 3 engine with the counterweight it ran without appreciable vibration and operated with entire satisfaction.

Counterweights were then placed on engines Nos. 1 and 2 driving the alternating current generators. As the dimensions of these engines and the weights of the reciprocating parts were the same as for the No. 3 engine, the same size of counterweights were used as for the latter, but those placed in the revolving fields were necessarily of a different form than that employed in the fly-wheel of the No. 3 engine. In these engines the high pressure crank leads; whereas, the low pressure leads in the No. 3 engine, and this was taken account of in

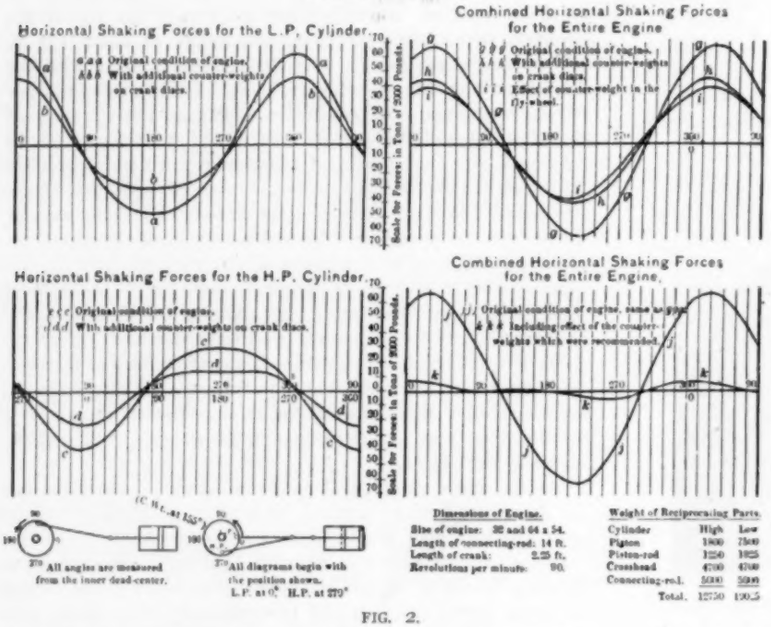

SHAKING FORCES
Horizontal Shaking Forces for the L.P. Cylinder.
Combined Horizontal Shaking Forces for the Entire Engine
Horizontal Shaking Forces for the H.P. Cylinder.
Combined Horizontal Shaking Forces for the Entire Engine.
Dimensions of Engine.
Size of engine: 32 and 64 x 54.
Length of connecting-rod: 14 ft.
Length of crank: 2.25 ft.
Revolutions per minute: 90.
Weight of Reciprocating Parts.
Cylinder High 1900 Low 7500
Piston-rod 1250 1825
Crosshead 4700 4700
Connecting-rod 5000 5000
Total. 12750 19025

FIG. 2.

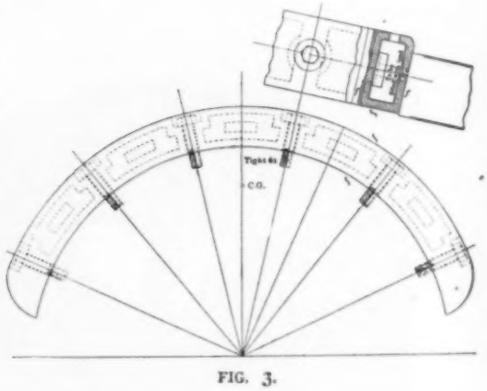


FIG. 3.

placing the counterweights in the revolving fields. The counterweights for the revolving fields of engines Nos. 1 and 2 are shown in Fig. 5.

There was some delay in arranging for a third visit to the plant. The buildings and the chimney of the plant were then completed. A vertical engine directly connected to a 2,500 kilowatt generator had been erected and was running in addition to the three horizontal engines. It was found that the greatest shaking that could be noticed occurred on the switchboard platform which was anchored to one of the side walls of the building at a point some distance above the floor. When engines Nos. 1 and 2, driving the 1,500 kilowatt alternators were run in parallel with the counterweights opposed they produced but little vibration. When run with the counterweights together there was a greater vibration. The greatest vibration that could be detected on the switchboard platform with the counterweights of the two alternating machines together and all the engines in the station running, including Nos. 1, 2 and 3, and a vertical engine which is designated as No. 4, was about .023 in. This maximum shake occurred when the counterweights of the three engines Nos. 1, 2 and 3 fell together, which would take place about once every 15 seconds, as the two engines running the alternators ran at about 94 revolutions per minute and that driving the direct current machine at 90 revolutions per minute. The amount that the floor shook was measured and was found to be extremely small and less than .002 in.

The ground was frozen during the above test and it was decided that it would be best to make a final set of observations of the amount of shaking after the frost was entirely out of the ground. Furthermore, some question arose as to the possible danger of the alternating current generators breaking out of step when run in parallel with their field counterweights opposed, because when so run, the ammeters attached to the generators swayed considerably, indicating fluctuations in the current.

On looking through the magnets of the revolving fields of one of the alternating current generators at the revolving field of the other the angular variation back and forth was apparent. This was carefully estimated and under the ordinary conditions of running was found to amount to from about 6 to 8 pole degrees total variation or from about 3 to 4 pole degrees for each machine. The amount of this angular variation with the machines running in parallel was about the same irrespective of the position of the counterweights with reference to each other, but when the counterweights were opposed the variations occurred every stroke or about 94 times per minute; whereas, when the counterweights were together, or nearly so, the variations occurred at less frequent intervals, the total number of such variations then being from about 30 to 40 per minute. As the total displacement of the two fields from their true position, as observed by looking through the magnets of one revolving field at the other, was about the same irrespective of the relative positions of the two counterweights, it follows that the displacement was produced as much through governor action as through any variation in speed during a single stroke.

When the two alternating machines were operating in parallel there was a swaying of the ammeters in the machine circuits. This swaying was, however, of an entirely different frequency from that of the strokes of the engines. The amount of this swaying was noted for different relative positions of the counterweights of the engines. The engines were operating at the time under light loads. The volmeter reading was also noted and found to be steady in every instance.

It appeared that the fluctuations in the current generated

by the two alternating machines had but little influence on their efficiencies and that they were working successfully when connected in parallel. The writer did not wish, however, to give an opinion on the electrical side of the problem and arranged with Albert F. Ganz, the professor of electrical engineering at the Stevens Institute, to accompany him at the time of making the final measurements. On a joint visit of Professor Ganz and the writer, observations of the angular displacement of the rotating fields and electrical readings were again taken and these observations led Professor Ganz to conclude that there was no apparent danger of the alternators breaking out of step while operating in parallel with the counterweights in any relative position.

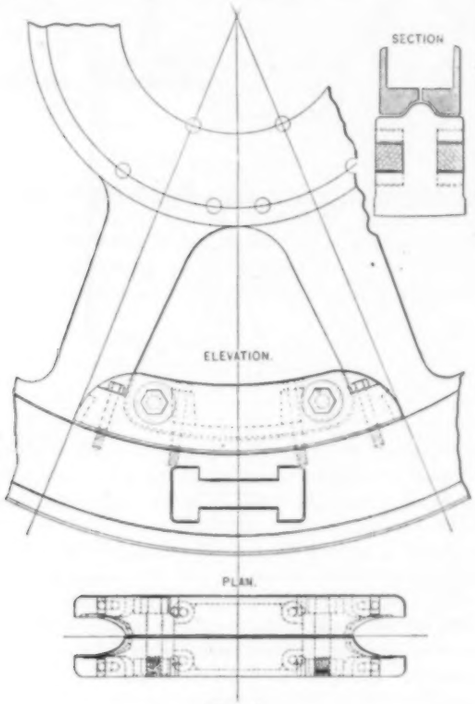


FIG. 4.

Careful measurements were also made at this time of the amount that the engines shook the building. Observations of the angular displacement of the revolving fields when run in parallel bore out in a general way those made on my previous visit. In order to study more thoroughly the effect of the counterweights in increasing the angular variation, diagrams of crank efforts were laid off corresponding to indicator cards taken from the engines and from these curves of crank effort the angular variation in pole degrees was determined. From these it may be seen that the variation for a single machine without the addition of the counterweights in the revolving fields would be 1.8 pole degrees, and with the counterweights 3.2 pole degrees. The latter value is the one to be compared with the variations observed by looking through one of the revolving fields and observing the other, and it agrees with the amount which was observed, which varied from 3 to 4 pole degrees.

By placing the counterweights in the revolving fields the angular variation during a single stroke is made about twice what it would have been without the counterweights. It however appears that the increased angular variation during a single stroke, due to employing the counterweights, does not introduce any great disadvantage, as the alternators can be safely run in parallel at practically the same efficiency as would exist should there be less angular variation.

As already stated the counterweights actually placed in the engines were of a less weight than the amounts called for but not enough so as to produce any great difference in the results obtained. They were also placed at different radii from those called for. The weights of the counterweights and their distances from the center of the shaft which were recommended and which were actually used as follows: For comparing these the product of the weights into the distances of their centers of gravity from the center of the crankshaft are given as these products are a measure of the effects produced on the shaking forces.

	Recommended.	Actually used
Engines Nos. 1 and 2 driving alternating current generators:		
Counterweights placed on crank disks	4,995	4,100 lb.
Counterweights placed in revolving fields	3,600	3,467 "
Distance of center of gravity of the weight in the revolving fields to the center of the shaft	7.67	7.56 ft.
Distance of center of gravity of the weights on the crank disks to the center of the shaft	2.38	2.77 "
Product of weight in tons by the distance in ft. — Crank disks counterweights	5.94	5.68 "
Product of weight in tons by the distance in ft. — Revolving field counterweights	13.81	13.11 "
Engine No. 3 driving direct current generator:		
Counterweight placed on crank disk of high-pressure cylinder	4,995	4,100 lb.
Counterweight placed on crank disk of low-pressure cylinder	4,995	4,180 "
Counterweight placed in fly-wheel	3,600	3,600 "
Distance of center of gravity of weight in the fly-wheel to the center of the shaft	7.67	7.06 "
Distance of center of gravity of the weights on the crank disks to the center of the shaft	2.38	2.77 "
Product of weight in tons by the distance in ft. — Crank disk (high-pres. cyl.)	5.94	5.68
Product of weight in tons by the distance in ft. — Counterweights (low-pres. cylinder)	5.94	5.79
Product of weight in tons by the distance in ft. — Fly-wheel counterweights	13.80	12.71
Weight of original counterweights on crank disks of all the engines	....	1,740 lb
Distance of center of gravity of the original counterweights from the center of the shaft	....	2.05 ft.

Fig. 6 shows characteristic records taken with the special instruments for measuring the amount of shake. The principle on which this instrument was constructed is shown in Fig. 7. A light pointer A was made to rest against a large mass suspended from a point at some distance above. In most of the experiments this mass was the lower block of the hoist of a traveling crane. This large mass was not affected by the vibrations of the building, or if affected its vibrations had a different period from those to be measured. The instrument was mounted at a part of the building where the vibration was to be measured and therefore moved in the same way as the building. In taking a record the drum B was revolved by hand by pulling the cord C and a curve was traced by a pen D on a paper placed on the drum B. The width of the diagram traced by the pen represented the

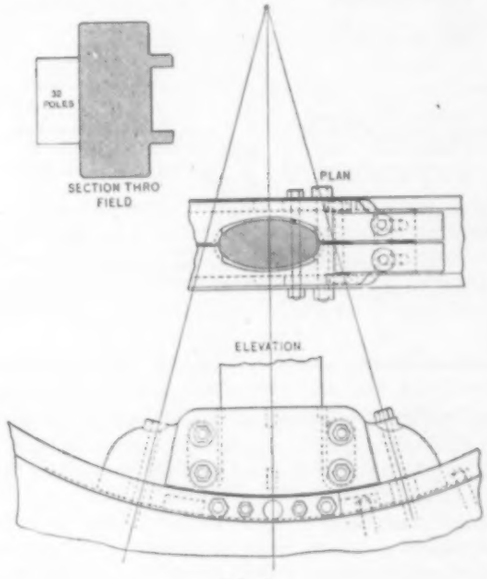


FIG. 5.

amount of vibration. In the diagrams the vibrations were magnified fifteen times. The fact that the cylinder was rotated by hand accounts for some of the irregularities of the curves, but this does not affect the accuracy of the records which depend only on the width of the waves measured from the top of one to the bottom of the one next following.

It may be seen from this plate that the amount of vibration was greater at the time of the last visit than it was when measured on Feb. 13. This is accounted for by the fact that the ground about the building was frozen on Feb. 13, whereas such was not the case when the final measurements were made. The final measurements gave 0.035 in. for the maximum vibration of the switchboard platform with all the engines running and with the counterweights of engines Nos. 1 and 2 together. The movement of the floor of the engine room and of the foundation for this set of conditions was 0.004 in. The amount that the foundation shook with the No. 3 engine running alone without counterweights, as measured on the first visit, was 0.01 in. It therefore follows that there was less than one-half the amount of vibration with all three engines running with their counterweights in such a position that they gave the maximum shake than there was with a single engine running without the additional counterweights.

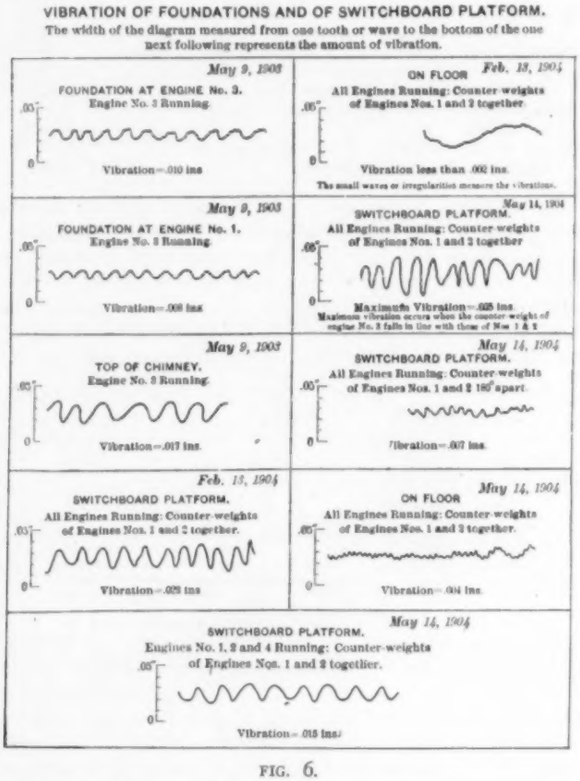

VIBRATION OF FOUNDATIONS AND OF SWITCHBOARD PLATFORM.
The width of the diagram measured from one tooth or wave to the bottom of the one next following represents the amount of vibration.
May 9, 1903
FOUNDATION AT ENGINE No. 3.
Engine No. 3 Running.
Vibration=.010 ins
Feb. 13, 1904
ON FLOOR
All Engines Running: Counter-weights of Engines Nos. 1 and 2 together.
Vibration less than .002 ins.
The small waves or irregularities measure the vibrations.
May 9, 1903
FOUNDATION AT ENGINE No. 1.
Engine No. 3 Running.
Vibration=.008 ins
May 14, 1904
SWITCHBOARD PLATFORM.
All Engines Running: Counter-weights of Engines Nos. 1 and 2 together
Maximum Vibration=.035 ins.
Maximum vibration occurs when the counter-weight of engine No. 3 falls in line with those of Nos. 1 & 2
May 9, 1903
TOP OF CHIMNEY.
Engine No. 3 Running.
Vibration=.017 ins.
May 14, 1904
SWITCHBOARD PLATFORM.
All Engines Running: Counter-weights of Engines Nos. 1 and 2 180° apart.
Vibration=.007 ins.
Feb. 13, 1904
SWITCHBOARD PLATFORM.
All Engines Running: Counter-weights of Engines Nos. 1 and 2 together.
Vibration=.025 ins
May 14, 1904
ON FLOOR
All Engines Running: Counter-weights of Engines Nos. 1 and 2 together.
Vibration=.014 ins.
May 14, 1904
SWITCHBOARD PLATFORM.
Engines No. 1, 2 and 4 Running: Counter-weights of Engines Nos. 1 and 2 together.
Vibration=.015 ins.

FIG. 6.

After the above investigation was completed Mr. Bushnell made observations with a transit to determine whether there was any shaking of the chimney with all the engines running and found that there was no perceptible motion.

To most nearly balance the horizontal shaking forces in one of the engines a counterweight equivalent to the entire mass of the reciprocating parts with its center of gravity at the crank radius should be used. It was impossible to place such a mass on the crank disk, and, as has already been stated, as heavy counterweights as possible were placed on the crank disks and an additional counterweight was placed either in the fly-wheel or in the revolving field.

The maximum counterweights which could be placed on the crank disks were estimated at 4,995 lb. at 2.38 ft. The counterweights originally on the engines amounted to 1,740 lb. at 2.05 ft., so that the counterweights originally on the crank disks, together with the counterweights added to the crank disks, amounted to 6,870 lb. at the crank radius. As the total weight of the reciprocating parts amounted to 12,150 lb. for the high pressure cylinder and 19,025 lb. for the low pressure cylinder there remained 5,880 lb. at the crank radius to be provided for by counterweight action in the high pressure cylinder and 12,155 lb. at the low pressure cylinder. To accomplish this action a counterweight should be placed in the fly wheel of 3,960 lb. at 7.67 ft. from the shaft center. For the direct current generator where the low pressure crank leads this counterweight should be placed about 155 degrees ahead of the low pressure crank, and for the alternating current

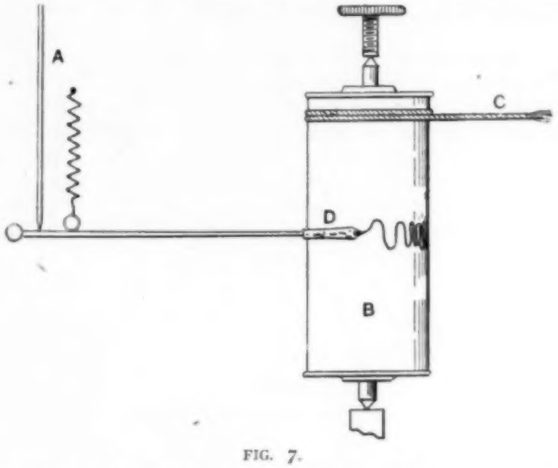


FIG. 7.

generators where the high pressure crank leads it should be placed about 115 degrees ahead of the high pressure crank.

The full counterweight was not, however, recommended, as a substantial balance of the horizontal forces would be obtained by employing a weight of 3,600 lb. in the fly-wheels or revolving fields instead of 4,000 lb., and it was considered advisable to keep slightly within the theoretical limit.

In plotting the shaking forces given in Fig. 2 the gravity component of the rod at the crank pin end is assumed to revolve with the crank pin and the remainder to have the same motion as the piston. As the distance of the center of gravity of the rod from the crank pin was 46 percent of the length of the rod, this gave 2,700 lb. for the revolving part at the crank pin and 2,300 lb. for the part which was assumed to move with the piston. This gives correct results as far as shaking forces are concerned.

BERTRAM ENGINE WORKS.

TORONTO, CANADA, June 12.—The arrangements for the acquisition of the Bertram Engine Works, Toronto, by the Canadian Shipbuilding Co., have been concluded. Frederic Nicholls, president of the company, states that the yards at Bridgeburg, on the Niagara river, will be used for building vessels of the larger type for service on the upper lakes. The Toronto works will be devoted to building ships of canal size and vessels for Lake Ontario. A. Augstrom will be general manager of the two yards.

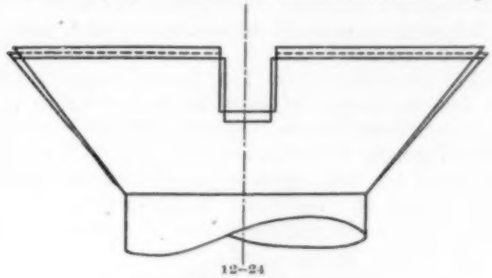
The Dominion Iron & Steel Co., of Sydney, N. S., has secured the contract for 25,000 tons of steel rails for the Intercolonial Railway, the contract to be filled within the present year. There was keen competition among manufacturers to secure the order, tenders being put in from the United States, Great Britain and Germany. The duty enabled the Sydney works to underbid their rivals. Preliminary tests of the Sydney rail mill are considered satisfactory and it is expected that the first rails will be turned out about June 20.

Trade shows increased activity as compared with last week and extensive orders are being placed for structural, bar, rod and plate goods. There are also large requirements for wire fencing.

HEADS OF MACHINE SCREWS.*

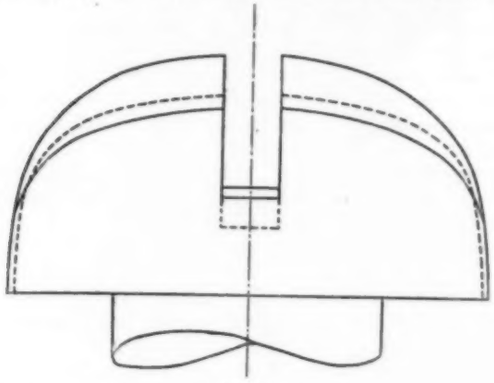
BY H. G. REIST, SCHENECTADY, N. Y.

The size and shape of machine screw heads as made by different manufacturers vary very greatly. In the case of screws made by some manufacturers the heads used on different sizes have different proportions, thus presenting a different appearance. The company with which I am connected is a large consumer of machine screws, and this variation has from time to time caused great inconvenience. Frequently designs are made to suit the screw heads of one manufacturer, and if afterwards it becomes desirable to purchase screws manufactured elsewhere, there may be an interference with other parts of the machine, due to the variation in size of heads. When fillister head screws were used with the space for the heads counterbored, it was necessary to make the counter-bore large enough to take the maximum size of head, thus not making a good appearance when smaller heads were used. The same was true in the case of flat-headed machine screws. The subject was taken up with several manufacturers of machine screws and it was found that they had no defined standard, but were open to suggestions, and were willing to supply screw heads to any ordinary dimensions without much if any extra cost. The extreme variation in dimensions found is shown graphically in the accompanying drawings by full lines, from which it will be seen that there is great irregularity, and, as stated above, the same manufacturers will in some cases supply larger heads proportionally than others. (See Figs. 1, 2 and 3.)



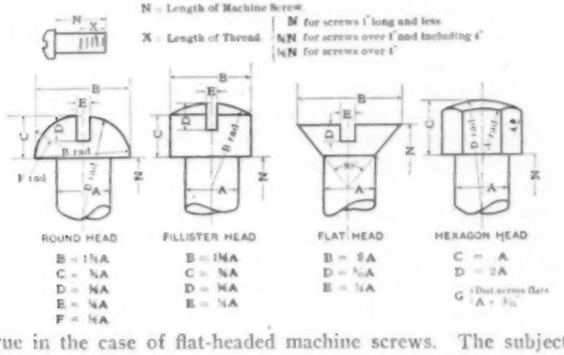
12–24

FIG. 1.



12–24

FIG. 2.

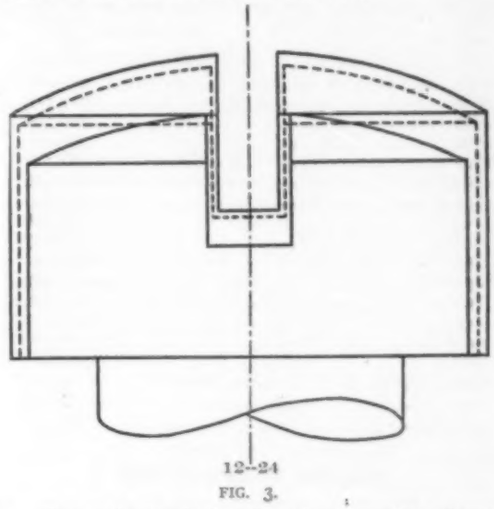


In order to establish uniformity in our own works we prepared the accompanying formula and table giving the shapes and dimensions of the heads of the size of screws ordinarily used.

Size of Screw	No. of Threads	Round Head Dimensions. A	B	C	D	E	F	Fillister Head Dimensions. A	B	C	D	E	Flat Head Dimensions. A	B	D	E
0	.....	.058	.103	.044	.059	.015	.029	.058	.097	.044	.059	.015	.088	.116	.057	.015
1	.....	.071	.126	.053	.068	.018	.036	.071	.107	.053	.068	.018	.071	.142	.068	.018
2	64	.086	.154	.068	.044	.023	.044	.086	.138	.065	.044	.023	.086	.174	.086	.023
3	48	.099	.172	.074	.050	.025	.050	.099	.149	.074	.050	.025	.099	.199	.099	.025
4	36	.113	.198	.085	.057	.029	.057	.113	.170	.085	.057	.029	.113	.226	.094	.029
6	32	.141	.247	.106	.071	.035	.071	.141	.212	.106	.071	.035	.141	.282	.042	.035
8	32	.166	.291	.125	.083	.042	.083	.166	.249	.125	.083	.042	.166	.332	.050	.042
10	32	.190	.333	.143	.095	.048	.095	.190	.285	.143	.095	.048	.190	.380	.057	.048
12	24	.221	.387	.166	.111	.055	.111	.221	.332	.166	.111	.055	.221	.442	.066	.055
14	20	.246	.431	.185	.122	.061	.123	.246	.369	.185	.123	.060	.246	.492	.074	.061

Size of Screw	No. of Threads	Hexagon Head Dimensions. A	C	D	G
14	20	.246	.266	.492	.434

The shape and proportional dimensions of these heads are shown by the broken lines in the drawings of the several forms of screw heads. It will be seen that these heads present a uniform appearance, and by submitting the table of dimensions we have had no difficulty in obtaining screws to the dimensions shown—in fact, the manufacturers have expressed themselves as pleased to have a standard to work to.



12–24

FIG. 3.

The author understands that there is a committee (appointed by the Society) at work on the standardization of machine screw threads, and it would seem to him that a report from them along these lines might make a valuable appendix to their work.

*Read at the Scranton meeting (June, 1905,) of the American Society of Mechanical Engineers.

Harvey Hubbell, Bridgeport, Conn., manufacturer of machine tools and electrical specialties, has incorporated his company for the purpose of making it a permanent institution, which will be run on practically the same lines as heretofore. The plant will be enlarged from time to time, as has been done in the past, continuing the same policy and the same lines of manufacture.

The Rapid Motor Vehicle Co., Pontiac, Mich., has increased its capital stock to $200,000 and purchased a site of 20 acres which will be established for factory buildings and the erection of homes for such of the men in the plant as care to take them. The main factory building will be 60 x 600 ft., and 200 skilled men will be employed. Associated with Max Grabowsky the matter of the power wagon which the company manufactures, are: H. G. Hamilton, A. G. North and F. G. Jacobs, of Pontiac.

COKE INDUSTRY.

Fifteen Hundred Ovens Added in West Virginia Districts.

The growth of the coke industry of the state of West Virginia and the important position the United States Coal & Coke Co., a subsidiary company of the United States Steel Corporation, now occupies in that field is shown in the annal report of the chief mining inspector of West Virginia for the fiscal year ending June 30, 1904. During that year 2,276,451 tons of coke were produced and the number of ovens had been increased by 1,500 to a total of 15,857. The United States Coal & Coke Co. now has seven coke plants in operation or under way, and during the year under review produced coke at four of them, having a total of 1,030 ovens, the total production amounting to 226,671 tons. Three plants were nonproducing, but the mines were in operation and at present close to 2,000 ovens are available for the production of coke. The plants of this company are located in McDowell county, the most important coke producing field in this state. It contains practically half of the ovens in the entire state and its production is proportionately large. The average selling price for the year was 1.83½ as compared with $2.66¼ the previous year. The annual coke production of the state since 1883 was as follows:

1883	190,889
1884	182,000
1885	187,619
1886	228,623
1887	481,477
1888	517,317
1889	360,716
1890	398,490
1891	1,208,418
1892	1,333,439
1893	1,090,909
1894	1,067,156
1895	1,204,657
1896	1,594,691
1897	1,374,497
1898	1,742,256
1899	1,950,179
1900	2,496,107
1901	1,932,912
1902	2,249,744
1903	2,483,376
1904	2,276,451

STRONG COMPETITION

In Agricultural Implement Trade in Australia—Canadian News.

TORONTO, CAN., June 12.—D. H. Ross, Canadian commercial agent in Melbourne, Australia, reports concerning the agricultural implement trade that competition has been much increased since the International Harvester Co. opened its own branches in Australia in 1900 and 1901. Owing to this cause and the abnormally large harvest in 1903, the trade in imported machines has been much overdone in the last three years. Though the harvest in 1904 was above the average, it fell much short of that of 1903, and a number of districts suffered for want of rain. The result has been a falling off in the demand for binders and drills. The total sales of the former for 1904 will not be more than one-third of the number delivered in 1903 and the drill trade will show a shrinkage of 50 percent. The machine most in demand this year was the stripper harvester, neither manufacturers nor importers being able to fill all the orders. The Massey-Harris Co., of Toronto, is the only importing concern which has brought in these machines in considerable numbers. The International Harvester Co. having introduced a limited number with fair success, it is understood that they will import an increased number for next harvest. Plows, especially the rotary disc type, are in good demand, not enough of that style being available to fulfill requirements. Mr. Ross states that the Australian market is being studied by several Canadian plow manufacturers who have hitherto paid no attention to the export trade.

The Manitoba Iron Works, Ltd., of Winnipeg,, has obtained the contract for two 66-in. boilers and a 250,000-gallon steel water tower for the Portage la Prairie water works and the cast iron work for the sewer system. They have installed bolt making machinery at their Winnipeg works and are turning out a quantity of bridge and structural iron work.

The following companies have been incorporated under the laws of the Dominion:

Canadian Shoe Machine Co., Ltd., Quebec; capital, $500,000; to take over the business of Ernest Caron. Incorporators: G. E. A. Jones, Ernest Caron, Chas. W. Walcot, Herbert E. Smith and Geo. H. A. Montgomery.

Ajax Metal Co., Ltd., Montreal; capital, $50,000. Incorporators: Gordan M. Pyke, John R. Meadowcroft, Wm. D. Hutchins, Wm. J. Henderson and Wm. D. Garland.

Consolidation of Plants.

The American Mfg. Co., Mattoon, Ill., has combined its interests with those of the Wayne Specialty Works of Milton, Indiana, and the new company will incorporate under the name of the North American Mfg. Co., under the laws of Indiana. The new company will assume control of the business June 15. The factory at Milton is the old Hoosier Drill Works, which has been in operation for the past thirty years, and is at present being operated by the Wayne Specialty Works. The Hoosier Drill Works removed their business from Milton to Richmond, Ind., 16 miles from Milton, where they are now located and in operation.

The probabilities are that drills will be manufactured again in this same factory, as drills of this company which have been on the market for the past thirty years or more. The drills in question are the Ashurst drills, of the Ashurst Drill Works, of Havana, Ill. The drill works at Havana, Ill., have been making these drills for many years. The company owns a large number of other patents in various lines from which it expects to manufacture, and it is the intention to carry on a general manufacturing business so far as capacity will admit.

W. R. Holloway, consul general at Halifax, Nova Scotia, writes to the Department of Commerce and Labor, at Washington, as follows: "A telegram from Moncton states that tenders are shortly to be invited by the Intercolonial Railway for large new shops to be erected here, also a new building for stores and offices for the mechanical department. The new shops will cover a space of 150 by 643 feet, and will be among the most complete in Canada. The erecting shop will have 24 pits, and will have a 130-ton electric crane for lifting locomotives, besides other first-class equipments. The new buildings, it is said, will cost several hundred thousand dollars.'

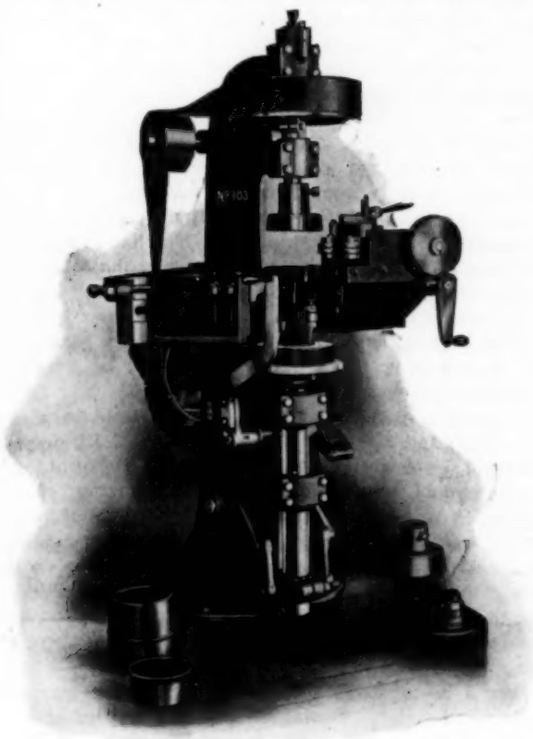
The American Locomotive Co. has completed arrangements whereby it will manufacture for the United States and Canada the Berliet automobile, a French car. Although one or two foreign designed cars are built in the United States, this will be the first experience of an American concern making a foreign car with American material and American labor complete in every detail. The American Locomotive Co. intends to make automobiles an important branch of its present manufacturing system. The first plant will be built in Providence, R. I., adjacent to the Rhode Island Locomotive Works.

The Standard Mfg. Co., Piqua, O., has been incorporated with a capital stock of $15,000, to manufacture elbows for spoutings.

SPECIAL DOUBLE SEAMING MACHINE.

Heretofore, with the exception of the work done in slow hand machines, the double seaming together of seamless drawn shells has been confined to metals of the lighter gauges. This, however, does not take into consideration double seaming done in a lathe where an inside steel ring is used to double seam against. Recent requirements have called for a rapid double seaming machine which will handle heavier stock, and for this purpose the E. W. Bliss Co., Brooklyn, N. Y., has built the machine here shown.

This machine is specially adapted for double seaming heavy round work and will readily handle stock up to No. 19 B. W. G. It can be used for regular double seaming operations, and by using the offset spindle, work such as shown on floor of the illustration can be successfully double seamed In order to obtain the required amount of pressure the seaming rolls are operated by a cam geared to the controlling handle. This cam is so arranged that after the rolls have been brought up home they automatically recede; this insures absolute uniformity of work as each seam is subjected to the same pressure. The offset spindle is held rigid and does not rotate, though the wheel against which the pressure comes revolves continually. The article to be double seamed is driven from the upper spindle and is rigidly supported in a deep chuck. This prevents the distortion of the work due to the severe pressure of the double seaming rolls.



A NEW DOUBLE SEAMING MACHINE.

Three speeds are obtained as there is a cone pulley on the back shaft. The machine will handle work from 5 in. to 12 in. in diameter up to 10 in. in height. The weight of the machine is 2,400 lb.

The American Mfg. Co., organized and promoted by J. M. Cripe, Mattoon, Ill., has secured control of the Hoosier Drill Works, Milton, Ill., and will take charge of the plant June 15.

EASTERN PENNSYLVANIA.

Unusual Production of Pig Iron at a Steelton Plant.—New Contracts.

New power plants are to be installed by the Reading Stove Works and the Textile Machine Works, two concerns operating plants in or near Reading, Pa.

The Pennsylvania railroad company plans further extensions of shops and railroad buildings at Enola, near Harrisburg, where it has built a large freight yard. Over 100 acres are graded at this point for new houses for railroad employes. The company is also spending several thousands of dollars for extensions to its Harrisburg shops, a permit having been issued for a building to cost $21,000. Improvements are also under way at South Altoona.

The Kennet Foundry & Machine works of Kennet Square, Pa., have been granted a state charter and will operate a large plant at that place. The new company has a capital of $50,000.

The month of May was a remarkable one for production of pig iron at the Steelton (Pa.) plant of the Pennsylvania Steel Co., an average of 1,150 tons having been made. This is a large production for the plant. The open hearth steel production for May was also very heavy. The company has started its No. 3 furnace, the largest of its stacks at Lebanon.

The Harrison (Pa) Pipe & Pipe Bending Co. has authorized an increase of $150,000 in common stock to be used for extensions to the plant, particularly the blooming mill.

The Ellis Keystone Agricultural Works, of Pottstown, Pa., has filed an increase of capital stock to $100,000.

The Reading railway company has given a contract to the Charles McCaul Co., of Philadelphia, for an extension to its shops at Reading. The extension will be 400 feet long by about 190 feet wide. Two engine tables and three cranes will be installed to be operated by electric power. There will also be a steel storage yard structure to contain a 10-ton crane.

The E. & G. Brooks Iron Co., of Birdsboro, has prepared No. 2 furnace for starting.

The W. F. Remppis Co. will start its works at Reading on double turn to handle the large number of orders. The company is making some of the structural work for the new Pennsylvania State Capitol at Harrisburg.

Standard Concrete Steel Co.

The Standard Concrete-Steel Co. was recently organized under the laws of New York with a capital of $500,000.00. This new company has taken over the Guy B. Waite Co., well known throughout the country as fireproofing engineer. The officers of the new company are, John F. Havemeyer, president; Harry L. McGee, secretary, and Guy B. Waite, general manager. It has opened offices at 100 Broadway and will continue to use the plant and yards located at 31st and 32nd streets, East River, New York, formerly used by the Guy B. Waite Co. The Standard Concrete-Steel Co. will continue to do a general fireproofing business, using the Guy B. Waite system, and in addition will estimate on and construct buildings, using the reinforced concrete steel construction. Its business will be handled in a conservative and business-like way throughout, and with its increased facilities, having a plant with all modern improvements for the rapid and economical production of fireproofing and concrete work, it is prepared to furnish estimates on general concrete construction throughout the country.

MAKING A MOLDER.*

BY H. M. LANE, CLEVELAND.

The molders of the past have been produced, first, by serving an apprenticeship, and second, by adding to the knowledge thus gained by traveling about and working in different shops. In the days when all foundries carried on a general line of work and but little machinery was used in the foundry, this procedure would produce an all-round molder.

In most cases these old-time molders were very good judges of the various local irons, and many of them would make creditable mixtures by judging the fracture. In the present day, however, a great many new factors have been introduced into the problem. In the first place the iron now furnished the foundryman varies between much wider limits and may contain greater quantities of impurities than that formerly furnished.

In the molding work itself two factors have entered the foundry trade which tend to produce specialists rather than all-round molders.

First, the various foundries have been led to specialize to the greatest possible extent. One of the first specialties to break away from the general foundry business was stove-plate trade, and this has now become so thoroughly separated that it is recognized as a distinct branch of the trade, and stove plate experience would be of but little use to a man if he were placed in a general jobbing foundry doing light or medium weight work. Many other specialties have split off from the foundry business, such as cast iron pipe, soil pipe, ingot molds, radiators, bath tubs, and other sanitary plumbing fixtures, etc. In addition to this, the malleable industry has become so specialized that the molders belonging to this division of the craft do not generally pass back and forth between malleable and gray iron foundries.

Second, many factors have been introduced into the shops themselves, the principal among these being the molding machine. The result of all this is that the high-grade molder for light floor work does not find the demand for his services which formerly existed; at least in proportion to the tonnage for this class of work that is turned out. The heavy workmen have suffered less from the changes that have taken place, on account of the fact that the methods of producing castings in this department have not undergone such radical changes. An all-round molder, however, should have experience in both light and heavy work.

The rapid fluctuations in the amount of work of each character being done in the foundry have also had a serious effect on the apprenticeship question. While the shop may have work enough at one time to warrant their employing a considerable number of apprentices, within a year of that time the character of the work upon which they can use apprentices may have all gone to the other fellow.

Apprentices have also been affected by the "Big wages quick" mania. As a consequence, after the boy has spent about half of his time in one shop, he is very likely to bolt and go into another shop where he gets journeyman's wages, or, if he is taken under instruction, gets much higher wages than he received in the first shop. When the wages go up the amount of work he turns out must also go up, and hence he is kept as largely as possible on one class of work. The result is that he becomes a poor workman with a limited amount of experience.

One foundryman stated recently that while he employed over one hundred molders in his place, his work was so highly specialized that he could not conscientiously take on a single apprentice, as he knew he could not teach them the trade, no matter how much he might desire to do so.

Skilled molders will always be required for some classes of work and we must provide some means for keeping up the supply of this class of men. Another factor, and one which is in some ways more important is the question of our future foundry foremen. As the work in the different foundries is more highly specialized, and as the number of difficult problems in the line of equipment increases from year to year, it results in an ever-increasing demand on the ability of the foundry foreman. The trade of molding could not be learned from a book, but more book knowledge is required now than formerly. The problem of where our future foundry foremen are coming from affects other departments of the shop as well as the foundry, and hence some of our brightest men have been discussing the subject and proposing different plans for its solution.

What seems to the writer one of the most feasible plans is to install a plant for the manufacture of quite a broad line of machinery. The plant should be large enough to employ about one thousand hands in all departments. It might manufacture the following line of machine tools: lathes, planers, milling machines, drill presses, and grinding stands. It should also manufacture a line of gas engines and of steam engines. It might also be well to manufacture some sheet metal working machinery and some wood-working machinery.

This would give a broad range, including a large amount of foundry and blacksmith shop work. The line of machinery could be disposed of to advantage by selling the entire outfit to some large jobbing house like Manning, Maxwell & Moore. In the foundry it would also be well to make some specialties requiring no machine finish, as for instance, track plates, stove legs, or something of the kind which could be gotten out largely on molding machines.

Connected with the establishment there would be a corps of teachers; and a regular course would require four years, distributed somewhat as follows: The student upon entering would spend nine months in a series of shop work which would correspond very closely to the shop work given in a manual training school. This would include some wood work, some patternmaking, a little experience on light work in the foundry, a few weeks in the blacksmith shop, and some time in the machine shop. This work would be accompanied by an elementary course of lectures upon these subjects or by studying in textbooks along these lines.

When a boy enrolled he would be expected to pay down one hundred dollars. During the first nine months he would receive no pay; and if at the end of this period he decided he did not want to learn the trade, he would be allowed to go and be given back one-half of the money he had paid in. If at this time he did elect to learn a trade, he would have to choose which trade he wished to follow. If he wished to follow the foundry trade he would first be put onto a molding machine and taught how to make a large number of different classes of molds in this way. This work would include instruction in the theory of molding machine construction and manipulation.

From the molding machine he would pass to the core department. In this department he would receive instruction in the making of cores by hand, and with the use of various types of machines. He would also receive instruction upon the value of the different core compounds or binders.

From the core department the boy would go to the light work floor, where he would spend some time, and then to the heavy work floor, where he would receive instruction both in green sand and dry sand work, also in loam work. This general course would occupy approximately two years and three months. The boy would then select his specialty and spend the last year on it.

Some instruction would be given in mixing iron by analysis, etc., and if a boy wished to become a foundry chemist there would be a post graduate course for this purpose, extending

*Read at the New York meeting of the American Foundrymen's Association, June, 1905.

through the fifth year. After the first nine months the boy would receive pay for his work at a certain fixed rate. Careful account would be kept of what he did, and if he exceeded a certain amount of work, he would be given a bonus above the fixed rate of pay, but all of this bonus would be kept back until he was through with his course. When he finished his course he would receive a certificate or diploma, would be paid back the original one hundred dollars which he deposited, with four percent interest, and would also be paid all accumulated bonuses, which in some cases might amount to several hundred dollars. The accumulation of this big bonus, together with the fact that if he left any time after the probationary nine months' period he would lose both the bonus and the hundred dollars, would serve as an incentive to keep the boy at work to the end of his course. In starting such a school it would be necessary to employ journeymen enough to run the entire factory, and it would always be necessary to employ journeymen to act as leading workmen and instructors, but after the third year it should not be necessary to employ more than 10 percent of journeymen, as by this time the boys would become pretty expert mechanics.

The education necessary for entering such a school would be simply a good common school education. The studies given during the course would be the equivalent of a high school education, or at least of the portion of it required by workmen of this class. Such an institution as this should be self-supporting after the first year or so, as while the boys would undoubtedly spoil a large amount of material, this would be in large measure offset by the fact that the boys would work for work's sake, in other words, would not soldier. While such a plant as this would not have any dividends to pay, it would nevertheless have to support the teaching force, which would probably be equivalent to a fair dividend on the capital invested.

The boys would probably work on an eight-hour basis, but would have recitations taking all or a portion of some of the half days, for instance, one class would have their recitations on Monday, Tuesday and Friday mornings, another on Tuesday, Thursday and Saturday mornings. In like manner the others would have afternoons of the alternate days. The plant would run six days a week throughout the year, with the exception of the ten days or two weeks' shut-down at the holidays, and the granting of such holidays as Decoration Day, Labor Day, Independence Day and Thanksgiving.

Such a school as this would make an excellent preparatory school for our technical schools and colleges, and while the graduate from this trade school would go to a technical school conditioned in foreign languages, he would receive credit for shop work which would more than balance his deficiencies in languages. For boys who wished to become foremen and managers, a fifth or post-graduate year could be arranged in which a course should be given on shop management, shop systems, etc. The students in this fifth year would be given positions as foremen or assistant foremen in different departments in the works.

One very important feature in this system would be the necessity of preparing a special course of text-books to fill the exact requirements of the case, and upon the preparation of such a series of books the success of the school would in large measure depend.

The ideal location for such school is a subject which should receive considerable attention. If placed in a large city it would be possible to arrange visits to other works; the libraries of the city would be available to the students and there might be some support from other works. If located in a small town 25 or 30 miles from a large city, the high city taxes would be avoided, there would be less going on at night to take the boys' attention from study, and it is probable that the works could be built on a somewhat more extensive plan, with more yard room, dumping ground, etc., which is a point worthy of consideration.

A NEW USE FOR OLD BOILER TUBES.

When visiting coal and metal mines, the writer has seen many piles of discarded boiler tubes. This is the case more often, where bad water is used in the boilers, and where the boilers have not had proper care in the way of cleaning, resulting in heavy deposits of scale, corroded and leaky tubes, which have to be cut out and replaced by new ones. These old tubes or flues, when sold as scrap, bring so little that it hardly pays the cost of moving them; yet, a few dollars spent in cleaning them and attaching flanges, will make of them, excellent air or water pipe which can be used where the pressure carried does not exceed 75 or 100 lb. per square inch. Wherever compressed air is used or water is to be pumped, the outlay for pipe is one of the large items of expense, and when used underground, only a small percentage of this pipe is returned to the surface in a serviceable condition. A year or more ago, this company had several hundred old boiler tubes mostly 3 in., 3½ in., and 4 in. in size and 16 to 18 ft. long which were considered practically useless until experiment proved their value for pipe. Threads and couplings cannot be used with success for joining the various lengths, for two reasons. First, the old tubes are usually too thin to allow for the threads, and secondly, they are apt to be out of a true circle. Flanging is therefore the best method for this purpose.—[D. E. Rust, in Mines and Minerals, for June.

Japanese Orders—Will Enlarge Plant.

As stated in these columns last week, the Middletown Car Works, Middletown, Pa., have received word that they had been awarded the contract for 500 steel frame gondola cars by the Japanese government, which is having 1,000 cars built in this country. The remainder of the contract will go to Milton & Berwick. The cars are for the Imperial railways. Some time ago the Middletown company received an order for 600 cars for the South American railway. This order is now being filled. The company, because of its large orders, has decided to enlarge the plant. Plans are now being completed for additional shops and buildings on the property in the rear of the present shops. The cars for Japan are to be of three and one-half foot gauge and seven feet, five and one-half inches in width as compared with eight feet for standard gauge car.

The American Steel Foundries has received an order from the Atlantic Coast Line for 1,000 cast steel body bolsters for 30-ton box cars to be built at the shops of the South Atlantic Car & Mfg. Co., at Waycross, Ga., and 2,000 cast steel body bolsters for the same class and capacity cars to be built by the Western Steel Car & Foundry Co., at their Anniston plant.

Mrs. Nannie H. Kelly, manufacturer of Center Furnace warm blast pig iron, announces that the furnace at Ironton, O., was blown in May 18.

At a meeting of the board of directors of the Westinghouse Electric & Manufacturing Co. held in New York recently Mr. E. M. Herr was elected first vice-president and chief executive under the president. Mr. Herr was locomotive superintendent of the Northern Pacific Railway for a number of years and is widely known among railroad managers.

All of the departments of Rathbone, Sard & Co., Auburn, N. Y., with the exception of the gas range department, shut down June 1 for the annual overhauling.

The recent visit of Charles M. Schwab and his secretary to the blast furnaces at Wharton, N. J., and the mines at Hibernia has caused considerable speculation.

Terry & Co., 92 Chambers St., New York, have taken the general agency and distribution of the Lamb gas marine engines built in Clinton, Iowa.

STARTING A STEAM TURBINE.*

BY A. S. MANN, SCHENECTADY, N. Y.

If a large steam turbine is cold and at rest how quickly can it be started? Can it be brought up to speed as readily as can a good cross compound engine that is cold all over? Most station men would have doubt as to the adaptability of the large turbine, say 1,500 kilowatts or 2,250 horsepower, for emergency work. So much has been written about the sensitiveness of a rotating disc to the changes of temperature and the effects of unequal expansion that it is easy to imagine difficulties in the rapid start. The possibilities of an engine with a 62-in. low-pressure cylinder in starting practically cold and coming up to synchronous speed are well understood. A station manager woud criticise an engineer who would open his throttle as fast as he dared without wrecking his piping system and let his machine jump into her work. One turn at a time on the throttle is about all that is considered safe, and even then a close watch is kept for groaning valves and cold back bonnets. Every time the starting valve is moved to increase the steam flow the engine is allowed to take its full increment of speed, due to that particular throttle position before the supply valve is moved a second time. There are ten large oil cups, and frequently more, that must be opened and adjusted before the machine moves at all, besides whatever oiling is to be done about the air pumps and other auxiliary apparatus. Most engineers would consider ten minutes as rather a fast start and fifteen minutes as a more usual starting period, including time taken for warming up; in fact, it may not be overstating the case to say that if it were known that an engine-driven plant were to be called upon in emergency for power and it were essential that the briefest possible time were to elapse between the call and the taking of the load, one or more engines would be kept in motion all the time, turning slowly and hot all over.

This question makes itself very prominent when the steam station is operated as an auxiliary to a large source of high tension power, which is itself in the construction stage and has a large overload capacity of its own to carry, supplying all sorts of apparatus that use electric power, railway, lighting and power circuits simultaneously. At such a time all sorts of accidents will happen to the high-tension water-driven plant, most of them due to the necessarily temporary character of many of the electrical connections. It takes months before an intricate system of wiring can be thoroughly relied upon, for it takes months before the temporary work of construction can be replaced.

The station at present under consideration is equipped with three Curtis turbine-driven alternators, 40 cycle, 10,000 volts, each of 1,500 kilowatts normal capacity. During the summer months the station is operated as an auxiliary to a water-power plant, taking all sudden overloads. A signal has been arranged, a ¾-in. whistle, so that it can be blown instantly should the power fail. A blast of that whistle means—cut in two turbines and bring the third up to speed. The load will be heavy, and all auxiliary apparatus must be in regular operation. Each turbine has a surface condenser and there are three or four pumps to be started for each pair of turbines; one circulating pump, one combined hot-well and feed pump, one pressure pump for the step bearings and one dry air pump, all of which are motor driven. The exciter is driven by a steam engine and must be started also, for it supplies current to a portion of the auxiliary apparatus. The boiler room has steam up at all times, supplying a system for manufacturing purposes other than power, and slow fires are kept in enough boilers to make steam needed for the normal load. Forced load means forced fires. The boilers have under feed stokers, equipped with pressure blast, and will respond quickly to a 50 percent excess call for steam. The operating force for this is about equivalent to a force for an engine-driven plant. Engineers and oilers, however, are busy about the building on construction work, installing new apparatus and taking such work as their regular occupation when the turbines are not running. At the sound of the whistle the water-tender starts a blower on the extra row of boilers: all blast dampers are opened up and all stokers are allowed to feed at the maximum rate. Each fireman dumps his free ash and bars over his red fire.

The man in charge of the coal and ash conveyor starts the pressure pump for step bearings. One of the turbine men starts the exciter which supplies current to the auxiliaries beside its field current; a second turbine man starts the circulating pump and then his turbine. The hot-well pump and the air pump are started by the oiler. These movements take place simultaneously. The force is organized upon the lines that obtain in a fire station; each man has his specific duty, and after performing it looks to see that there is nothing more for him to do. Only a few seconds elapse between starting the first pump and starting the first turbine. The turbine throttle is opened as fast as an 8-in. steam valve can be opened without endangering the steam piping system. It is not considered advisable to open the throttle valve as fast as a man's strength will permit; but if nothing unusual occurs in the pipe line, sentiment does not spare the turbine. One electrician attends to the switchboard and telephone. As soon as the machine approaches speed, the synchronizing system is cut in and the main switches are got ready. One and one-half minutes will do all the work here outlined, including the time taken in mustering the crew from various parts of the building, itself not a trivial matter.

Manipulating an engine regulator so that it shall be at a precise speed and at an exact phase relationship from some other machine, not more than 1-1,500 part of a second removed from it, is no matter that can be hurried, and one minute is fast time on such work. But the whole thing, phasing-in and all, has been done in 2½ minutes, including full load on the turbine, which started from a standstill.

This performance has been gone through a great many times, and our record book shows that out of 43 such calls, 10 starts were made in 2½ minutes, 18 in 3 minutes and 15 in 3½ minutes.

We have taken the time in a number of instances when all the auxiliaries have been in motion and it only remained to start the turbine and phase it in on the line: the only valves to open in such cases are the throttle and one small oil valve. The two quickest starts have been made in 45 seconds and 70 seconds, respectively, including phasing in. Others range between one minute ten seconds and one and one-half minutes. These two quickest starts were made on a turbine which had stood for twenty-four hours with the throttle valve shut tight though there was a slight leakage past the seat. After the throttle valve is off its seat it is not more than thirty seconds before the turbine is up to speed. A cross compound reciprocating engine of the four valve type, 2,250-h. p. capacity, can be brought up to speed from a standstill in five minutes if it is hot all over. This five minutes is to be compared with the seventy seconds required for the similar turbine operation.

A reciprocating engine, which is turning over slowly with the throttle valve just off its seat or with by-pass open and having all its oil cups open and regulated, can be brought up to speed, say 75 turns, in two and one-half minutes. This can be compared with the 30 seconds necessary for bringing the turbine up under the same conditions; that is, about one-fifth the time necessary for bringing up the engine.

If the engine is cold all over and has all its oil cups shut tight, all its auxiliaries quiet, 15 minutes is called a rapid start. Starts have been made under such conditions in 12 minutes. When we start a cold turbine, we open up the valve and let her turn, and in two minutes we are ready to bring her up to speed and she will be at speed in two and one-half minutes, dividing the engine's time by more than four.

*Read at the Scranton meeting, June, 1905, of the American Society of Mechanical Engineers.

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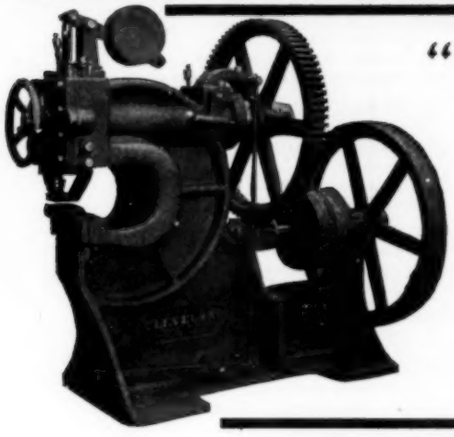

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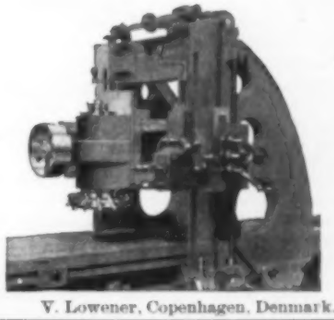

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†Nortmann-Duffke Foundry Co —
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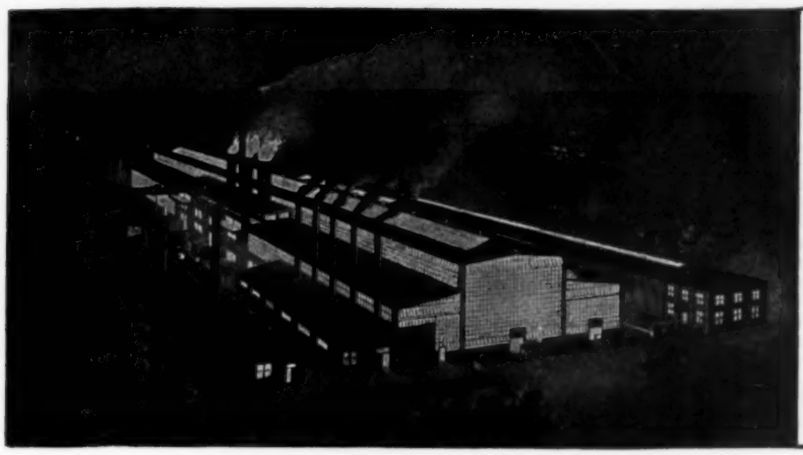

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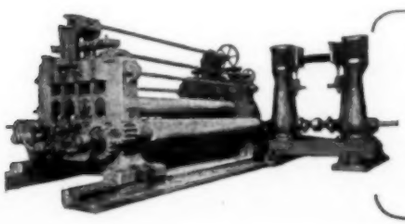

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Pickands, Mather & Co 93
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Pittsburg Valve Fdy. & Construction Co 75
Powell & Colne 91
††Pratt & Letchworth Co 77
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†Reed, F. E., Co ..... —
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*Richardson & Co 97
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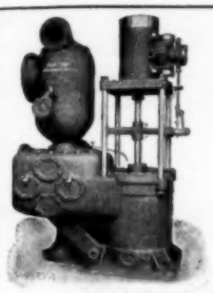

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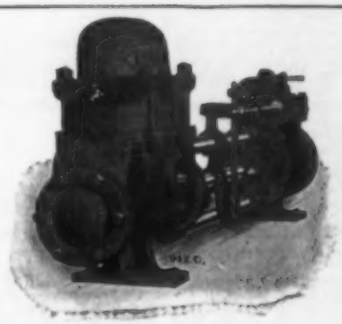

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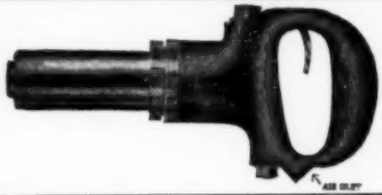

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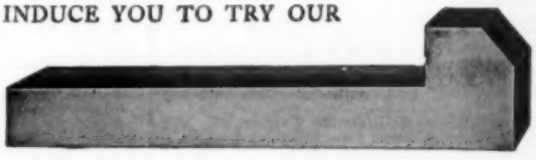

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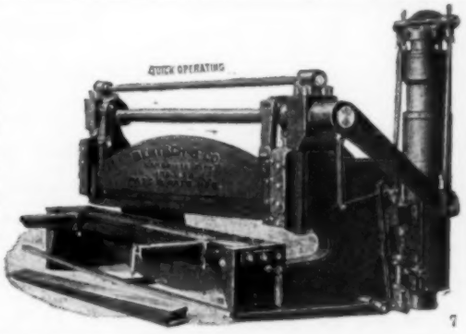

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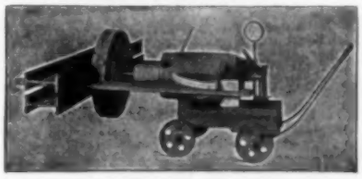

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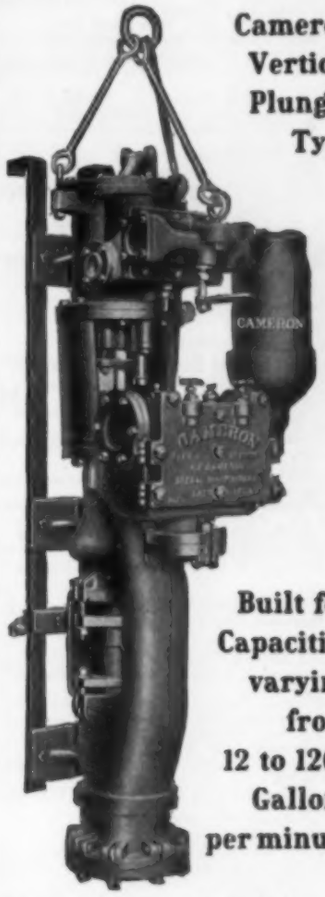

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P. Blaisdell & Co., Worcester, Mass.
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J. J. McCabe, New York City.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
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Dayton Pneumatic Tool Co., Dayton, O.
General Pneumatic Tool Co., Montour Falls, N. Y.
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Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
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Chambersburg Engineering Co., Chambersburg, Pa.
Chas. F. Elmes Eng. Works, Chicago, Ill.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Great Lakes Engineering Wks., Detroit, Mich.
Long & Allstatter Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
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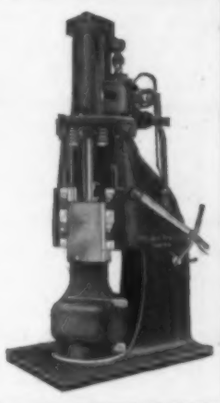

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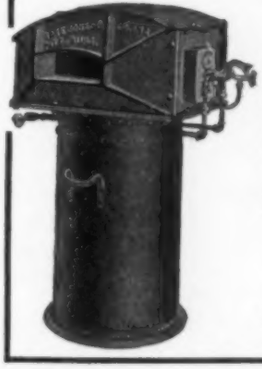

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